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Thos V. Okes
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CONSIDERATIONS
ON THE
MEDICINAL USE
OF
FACTITIOUS AIRS,
AND
ON THE MANNER
OF
OBTAINING THEM IN LARGE QUANTITIES.

IN TWO PARTS.

Part I. by THOMAS BEDDOES, M. D.
Part II. by JAMES WATT, Esq.

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AT *the cloſe of the year* 1792, *three of my friends conceived that ſome good might ariſe from an experimental inveſtigation of thoſe phyſiological conjectures which I had lately publiſhed. They accordingly offered to bear a part of the expence attending the conſtruction of a pneumatic apparatus, and the ſalary of a perſon to conſtruct and ſuperintend it. Without their co-operation, I ſhould probably have attempted nothing of this kind. They agreed to riſque with me the ſacrifice of* TWO HUNDRED POUNDS *each. Now, as I firmly believe that the condition of humanity will be improved in conſequence of the application of pneumatic chemiſtry to medicine, juſtice requires me to name the perſons who ſhewed ſo liberal a ſpirit in promoting the attempt. They are* Mr. WILLIAM REYNOLDS, *and* Mr. JOSEPH REYNOLDS, of Ketley, *and* Mr. WILLIAM YONGE, *Surgeon of* Shefnal, Shropſhire.—*What* Mr. WATT *has contributed to this pamphlet, ſhews that I have been further nobly aſſiſted.*

Many medical practitioners have approved the deſign. Some, as I have been informed, go about decrying it as vehemently as philoſophers of perhaps the ſame ſtamp, in a former age, decried the diſcovery of HARVEY. *I, however, make no pretenſions to diſcovery, and have merely endeavoured to promote inveſtigation in caſes where either uniform failure, or frequent want of ſucceſs, proves how much we need ſomething better than we poſſeſs; and, to pronounce before trial, that this may not be in part ſupplied by elaſtic fluids—ſubſtances ſo active in Nature—may, without breach of charity, be conſtrued as arguing the moſt arrogant preſumption, the moſt ſordid deſire of gain, brutiſh ignorance, or perſonal ſpite.—As to hypotheſes, I hold that their ſole value conſiſts in ſuggeſting new experiments, and in procuring more accurate obſervations: aſſuredly, therefore, if I cannot rival them in their better part, I ſhall not imitate certain great men in the weakneſs they have diſcovered, by fond attachment to untenable opinions.*

Men of ſcience, without any exception known to me, have expreſſed a wiſh that the enquiry ſhould be proſecuted as extenſively as poſſible, till we arrive at ſome certain concluſions. This alſo, as far as I can collect, is the ſenſe of the Public. It has occurred to me, that ſome plan, like the following, would moſt ſpeedily and certainly determine the medicinal virtue of factitious airs, and therefore moſt effectually put Society in poſſeſſion of the benefit they are capable of affording, whatever that may happen to be.

PROPOSAL.

I FLATTER myſelf, that in a work entitled, *Obſervations on Conſumption, Fever, and other diſeaſes*, in my *Letter* to *Dr. Darwin*, and in a late collection of *Letters* from different correſpondents on the ſubject of Pneumatic Medicine, it is abundantly proved, that the application of factitious airs to the cure of diſeaſes, is both practicable and promiſing. This method of treatment has been very lately adopted abroad, and appears, as far as it has been tried, to have exceeded rather than diſappointed expectation. The following experiments on animals, and ſome clinical obſervations, of which an account will ſoon be given to the Public, muſt, I think, confirm the hopes entertained by many friends of humanity, concerning the medicinal efficacy of elaſtic fluids. Although, however, I might be allowed to ſuppoſe that enough has been done to encourage further enquiry, I am ſenſible that facts are wanting to eſtabliſh general concluſions. To what preciſe extent, therefore, the new mode of practice may be advantageous, remains to be decided by cautious experience.

This object, I conceive, may be much more effectually accompliſhed in two years, by means of a ſmall appropriated *Inſtitution*, than in twenty years of private practice: and perſons of high reſpectability, both belonging to the medical profeſſion, and others, have expreſſed their wiſhes that ſome attempt might be made to carry ſuch a deſign into execution. They are alſo of opinion, that an adequate ſubſcription may ſpeedily be raiſed, ſince nothing is more urgent than to reſtore health, and preſerve life.

Such an Inſtitution ſhould be conducted with a view to the attainment of two objects.—1. To aſcertain the effects of theſe powerful agents in various diſeaſes; and 2. To diſcover the beſt method of procuring and applying them.

The fidelity of medical narrations is of immenſe importance. But the publications of the fraudulent and the undiſcerning have almoſt deſtroyed all confidence in reports of ſucceſsful treatment. No means, therefore, of ſecuring authenticity, ſhould be neglected. The whole buſineſs ſhould be conducted in the moſt open manner poſſible, ſecrecy of any ſort being manifeſtly incompatible with a deſign, calculated for the univerſal benefit of mankind. Hence, not only ſubſcribers, but others ſhould be admitted to enquire and inſpect at convenient times. It is ſcarcely neceſſary to add, that the greateſt care ſhould be taken to aſcertain the nature of each caſe, and to regiſter the changes produced by the airs, as well as every other particular relative to the patient. A dwelling-houſe, capable of receiving twelve patients, may, as it appears to me, be made fully to anſwer the purpoſe; ſince in many caſes the airs may be adminiſtered without keeping the patient conſtantly in the houſe. In two or three years, ſuch an eſtabliſhment ought to render itſelf uſeleſs, by ſo far ſimplifying methods and aſcertaining facts, that every practitioner of medicine, at leaſt, may both know how to procure and how to apply the different elaſtic fluids, ſuppoſing they ſhould be found ſerviceable in any ſpecies of diſeaſe.

The other articles of expence do not ſeem extremely formidable. They may be reduced to the following heads:

1. Houſe rent and furniture.—2. Air apparatus and materials.—3. Salary of a Medical Superintendant, anſwering to the Houſe Apothecary of hoſpitals, whoſe buſineſs ſhould be to direct the chemical proceſſes, and to adminiſter airs and medicines under the direction of the Phyſician.—4. A man ſervant, to aſſiſt the ſuperintendant.—5. Two female ſervants, one a nurſe.—6. Contingent expences of advertiſing, paper, printing.—7. Medicines.

It would further be deſirable, that the SUPERINTENDING COMMITTEE ſhould be enabled to give premiums for the communication of ingenious methods of procuring, purifying, and adminiſtering airs. In this department, much remains to be done.

For the whole, three or four thouſand pounds would probably ſuffice; but the plan might be contracted or enlarged, according to the amount of the contributions. At all events, it ſhould be underſtood that no ſecond application would be made for ſubſcriptions.

To obviate miſapprehenſion, it may be proper to remark, that the propoſed inſtitution ought not to be confounded with ordinary charitable foundations, either with regard to its *object*, or to its *duration*. It is not for the ſake of relieving that diſtreſs which ariſes from poverty, but that which ariſes from the imperfect ſtate of medicine, that the preſent propoſal is ſubmitted to public conſideration. From this latter ſpecies of diſtreſs it is evident, that no degree of affluence can exempt any individual. Relief is only to be found in more powerful means of cure, or in a more ſkilful application of the means, already in uſe. The exiſtence of dangerous and even incurable diſeaſes, furniſhes lamentable proof of the neceſſity of ſuch improvements in the moſt important of all the arts: with the great frequency of ſuch diſeaſes, the common occurrences of life allow no one to be unacquainted.

As the firſt ſtep neceſſary towards the execution of a deſign which depends upon public patronage, is to make application to the Public, I take the liberty, at the riſque of that diſgrace which ſometimes follows diſappointment, to propoſe

1. That perſons diſpoſed to contribute to a MEDICAL PNEUMATIC INSTITUTION, give in their names and ſubſcriptions to

Mr. Thomas Coutts and Co. Strand.

Eſdaile, Hamett, Eſdaile, and Co. Lombard-Street.

Meſſrs. Pybus, Call, Pybus, Grant and Hale, Old Bond-Street.

Meſſrs. Ranſom, Moreland, and Hammerſly, Pall-Mall.

Meſſrs. Smith, Payne, and Smiths, George-ſtreet, Manſion-Houſe.

Meſſrs. Staples, Newman, Anderſon, Staples, and Lynn, Cornhill.

2. That the ſubſcriptions be veſted in the names of Sir Benjamin Hamett, M. P. Alexander Anderſon, Eſq. and John Grant, Eſq. of Waltham Place, Bankers in London, who have obligingly undertaken to act as truſtees to the Inſtitution; and who will diſpoſe of the ſums ſubſcribed, as a Committee to be appointed by the ſubſcribers ſhall direct.

3. That the ſubſcriptions be advertiſed.

4. That before March 1, 1785, a general meeting of the ſubſcribers be called at ſome convenient place in London, in order to appoint a Committee, to fix upon the ſituation of the Inſtitution, to chooſe a Phyſician, &c. &c.

5. That the plan formed by the Committee be tranſmitted a month before its execution to each ſubſcriber for his ſuggeſtions.

It is, I believe, in the higheſt degree improbable that ſuch an eſtabliſhment ſhould be totally unproductive of benefit. But even in the worſt event, to have the merit of the project decided by a proper trial, will afford a ſort of melancholy ſatisfaction to perſons labouring under diſeaſes at preſent invariably fatal, and to their friends. For as it is generally known both that new means of relief have been propoſed, and that the inefficacy of theſe means has not been determined by experience, it is eaſy to imagine how diſtreſſing muſt be the feelings of both parties, eſpecially thoſe of the deſponding ſufferers, when they find themſelves unable to procure a ſupply of elaſtic fluids at home, and when their circumſtances will not allow them to ſeek the only chance of recovery abroad. Whereas, if they could be ſatisfied that the means, which they deſire in vain, have been tried and found inadequate, all regret on this account would ceaſe.

Although I have always ſtrictly confined myſelf to arguments in behalf of *a trial* of airs in medicine, *without giving the ſmalleſt aſſurance of ſucceſs*, it may be thought that the Inſtitution ought to be confided to a phyſician leſs prejudiced in favour of the project, than I can be ſuppoſed to be. In this deciſion I ſhall cheerfully acquieſce. If, however, a contrary opinion ſhould prevail, my ſervices ſhall not be withheld from the Inſtitution.

Should the preſent application be totally neglected, either as unworthy of regard, or becauſe deſigns, capable of promoting the general welfare, may eaſily fail to excite intereſt, even when they do not provoke ridicule, I ſhall ſtill direct elaſtic fluids in thoſe diſeaſes, which continue the *reproach of medicine*, whenever I perceive the proſpect of an happy iſſue. In whatever caſes the practice proves uſeleſs or diſadvantageous, I ſhall as earneſtly diſſuade from it as I before adviſed the trial. For although it is confeſſedly meritorious to explore the powers of nature, to miſrepreſent them where health is concerned, appears to me a flagrant crime againſt ſociety.

MALL, CLIFTON, *Sept.* 30, 1794.

Whether this plan be executed or not, it is ſatisfactory to reflect, that Pneumatic Medicine is now in ſuch a train, that neither violent obloquy, nor artful inſinuations, can hinder it from proceeding, and its value from being ſooner or later determined. The practice will be much facilitated by the machinery deſcribed in the following pages; and, in a few weeks, its efficacy, in ſome formidable diſorders, will be ſhewn by the publication of well authenticated facts.

PART I.

A FAMILIAR EXPLANATION OF THE *Principles on which Benefit may be expected from* FACTITIOUS AIRS *in Various Diſeaſes.*

I.—*Of the Atmoſphere.*

IT is proved, by ſatisfactory experiments, that the lower region of the atmoſphere conſiſts of two kinds of air, quite diſtinct in many properties. One is the kind called VITAL, DEPHLOGISTICATED, or OXYGENE AIR, and by a variety of names beſides. The other has been named AZOTIC, PHLOGISTICATED, FOUL, or BAD AIR. Where the lower atmoſphere is not altered by the breathing of animals, the burning of fuel, by exhalations from ſubterraneous chemical proceſſes or putrefying ſubſtances, and ſuch local cauſes, if you confine and examine an hundred cubic inches, you will find twenty-ſeven or twenty-eight to be oxygene, and the remaining ſeventy-two or ſeventy-three azotic air. The manner in which air may be impriſoned and examined, is deſcribed in the writings of Dr. Prieſtley, Mr. Scheele, Mr. Cavendiſh, and Mr. Lavoiſier. Theſe authors explain much of the nature of oxygene and azotic air. A candle burns in a veſſel full of oxygene air with dazzling brilliancy, and is conſumed with great rapidity. This air, when it unites with them, turns various ſubſtances ſour, as beer, milk. It changes black blood from a vein to a bright, florid, ruddy colour. You may ſee this difference of colours, by breaking a clot of blood that has ſtood a little time in the air; the ſurface will be ruddy, the inſide dark coloured. The reaſon is, becauſe the ſurface of the blood draws to itſelf ſome oxygene from the atmoſphere. When black blood is put into azotic air, it does not become ruddy. Azotic air extinguiſhes flame, does not burn when mixed, or in contact, with common air, and is not abſorbed by lime-water.

Near the earth, theſe two airs are found mixed with ſurpriſing exactueſs. Take a cubic foot from ten different places, and you will find that a little more than a quarter of each is oxygene; the reſt azotic air; a little carbonic acid air, as one part in an hundred, is often found, though no fires burn, or animals breathe near.—The nice balance of attraction between the two conſtituent parts of the atmoſphere, deſerves notice. Theſe two ſubſtances, when cloſely united, form nitrous acid: If, therefore, they had a ſtronger attraction, or were not, by ſome circumſtances, prevented from uniting cloſely, all the oxygene, with part of the azote, would be changed into this highly corroſive acid. Again, azotic is lighter than oxygene air; if, therefore, they had not ſome attraction, they might ſeparate, and any animals, that ſhould be immerſed in an atmoſphere of azotic air, would almoſt inſtantly expire: The undiluted oxygene remaining below, would, as we ſhall preſently ſee, occaſion violent diſeaſes in quadrupeds with warm blood and in man, as well in many other animals.

II.—*Of the breathing of man and animals with warm blood.*

If you fix a pipe to a bladder full of air, and, holding your noſtrils, breathe this air for ſome time, your diſtreſſed feelings will inform you that it is no longer fit for breathing. If you transfer this breathed air into an inverted glaſs jar full of water, and turn up the jar ſo as to keep in the air, and admit none from the atmoſphere, you will find that it extinguiſhes a candle, and deſtroys the life of a ſmall animal, dipped into it. If you procure another quantity of this air, and add to it a little more than one fourth of oxygene air, a candle will burn in it juſt as in the atmoſphere; and you may breathe it as long as ſo much freſh air, though it is not exactly the ſame; for it contains, after being breathed, ſome fixed or carbonic acid air, either thrown out from the blood, or formed in the lungs. Theſe experiments indicate, that breathing renders common air unfit for ſupporting life or flame, by depriving it of oxygene. Various other experiments, by the philoſophers above-mentioned, ſhew further that this is the caſe. The blood, before it paſſes through the lungs, is dark; after paſſing, it is florid; dark blood in a bladder, expoſed to the atmoſphere, becomes florid ſuperficially; and in breathing, the blood and air are only ſeparated by membranes not unlike a bladder. Dark blood, introduced into veſſels containing oxygene or common air, leſſens its quantity, as it becomes ruddy. Hence it appears, that the blood drinks up a portion of the oxygene air received into the lungs; and from various conſiderations, this appears to be uſed in the contraction of the muſcles, & in ſeveral fluids, ſecreted from the blood; for the blood, after traverſing the body, comes back to the lungs dark, or without the oxygene, which it received in paſſing through them. It has been calculated, that an healthy man requires nearly five cubic feet of air, or 1½ cubic feet nearly of oxygene air, every hour.

So much is premiſed to render the following experiments and ſpeculations intelligible to ſome readers.—They will find more in Dr. Goodwin's *connection of life with reſpiration*, Mr. Coleman's *diſſertation on ſuſpended reſpiration*, Dr. Menzies' *Tentamen de reſpiratione (Annales de Chimie*, 1791, p. 211), in my three publications on the propriety of employing elaſtic fluids in various diſorders, and the chemical authors already quoted.

It appears that the ſkin imbibes and exhales air. It will imbibe various kinds; but, as it is found in equal times to take in three or four times as much oxygene air as any other, it probably ſelects oxygene alone from the atmoſphere. Some philoſophers ſuppoſe the human ſpecies to have exiſted in a monkey ſtate; would the hair then ſo much prevent the cutaneous abſorption of oxygene as the cloaths at preſent?

III.—*Though the proportion of oxygene in the atmoſphere may be beſt adapted to the average ſtate of health, may the proportion not be ſmaller than is beneficial in ſome diſorders, and larger than in others?*

Conſiderate perſons will, I conceive, reply that this is probable. I have made many experiments on animals, to illuſtrate the effect of atmoſpheres of various conſtitution. I ſhould have made more, had I not been abſent from England, or travelling for the greater part of the laſt eight months. No inveſtigation of greater importance to humanity, or extent, can be imagined. This is only a rude beginning. Others will aſſiſt in continuing the enquiry.

IV.—*The effect of breathing oxygene air undiluted.*

Dr. Prieſtley and Mr. Lavoiſier found animals either to die, or to become exceedingly ill in ſuch air, while it continues more oxygenated than the atmoſphere, and will ſupport the life of other animals. It is not then defect, but exceſs of oxygene, that is pernicious here. The heart and arteries pulſate more quickly and forcibly; the eyes grow red and ſeem to protrude; the heat of the body is ſaid conſiderably to increaſe (a), ſweat to break out over the whole body, and fatal mortification of the lungs to come on. Theſe appearances denote violent inflammation: Animals have always appeared to me to ſuffer extremely, ſoon after immerſion in unmixed oxygene air. To my own lungs, it feels like ardent ſpirits applied to the palate; and I have often thought I could not ſurvive the inſpiration of oxygene air from manganeſe by heat many minutes. The exiſtence of inflammation is fully eſtabliſhed by diſſection, as others have found, and as appeared from the following experiment. A large kitten was kept ſeventeen hours in a veſſel containing ſeveral cubic feet of air from manganeſe, of which about eighty parts in an hundred were oxygene. This, and another kitten of nearly the ſame ſize, which had lived as uſual, were then diſſected in my preſence, by Mr. Guillemard, of St. John's College, Oxford, who immediately made the following minute of the appear-

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(a) Girtanner Antiphlogiſtiſche Chemie, p. 263.

ances:—"The lungs were of a florid red colour in the "oxygenated kitten (A); in the other (B), they were "pale; the difference was very ſtriking, both in the in- "flated and uninflated ſtate; the edge of one lobe in A "was marked with livid ſpots (as in mortification). The "pleura was likewiſe evidently inflamed. The heart in "A was of a florid red colour. The liver, kidney, "ſpleen, and blood veſſels of the meſentery and urinary "bladder, were of a brightiſh red colour. In B, the "heart was of a deepiſh colour. The liver, ſpleen, "kidneys, and blood veſſels in general, were of a bluiſh "or purple colour. Both kittens had been ſucceſſively "killed by immerſion under water. Upon opening into "the head, there was no appearance of inflammation.— "The blood veſſels had rather a florid colour; but there "was no ſign of extravaſation, or more than the uſual "quantity of blood. In B, on raiſing the ſkull, there "appeared a quantity of blood between the bones and "the membranes of the brain, of which the blood veſſels "were turgid with dark-coloured blood.

"In A, the heart readily obeyed the ſtimulus of "pricking: The ſpontaneous contractions of the right "auricle and ventricle were frequent; they continued "with little diminution of frequency and force for above "half an hour. In about an hour, they had wholly "ceaſed.

"In B, the irritability of the heart was at firſt equi- "vocal. On opening the pericardium half an hour after "the ſternum had been removed, the motions of the "heart became very viſible; they continued more than "an hour after the firſt expoſure of the contents of the "thorax."

The univerſally diffuſed florid colour in A was particularly ſtriking: So was the dulneſs of one heart at firſt, and the vivacity of the other: Of the latter, I believe the ſpontaneous pulſations in all were many times more frequent and forcible; though this circumſtance deſerves more particular examination than we beſtowed upon it. The kitten (A) had eaten ſome time after being put into the reſervoir, as appeared from the ſtate of ſome food introduced at the ſame time. The air ſeemed to have ſuffered little diminution either in quantity or quality:

The reaſon will appear from a ſubſequent experiment. On cutting the wind-pipe of A to blow up the lungs, a good deal of viſcid mucus flowed out. This was occaſioned by ſtrong action continued for ſome time, and was not ſeen in B.

V.—*Experiments with air, containing ſomewhat more oxygene than the atmoſphere.*

In my letter to Dr. Darwin, I conjectured " that " Divers would be able to continue longer under water, " if before immerſion they were to breathe air of an " higher than the ordinary ſtandard" (p. 13). I made ſeveral experiments to determine whether this ſuppoſition was juſt; in each two animals of the ſame litter were employed; and as ſeveral ſpectators were ſometimes preſent, they were deſired to fix upon the weakeſt for oxygenation. The following report I literally tranſcribe from my journal, as it was ſettled and ſubſcribed by the ſpectators: " Auguſt 20th, 1793. Kitten C was placed " in a mixture of nearly two-thirds oxygene air from " mangeneſe, and one-third atmoſpheric air; it was " kept twenty minutes in the veſſel, which was from " time to time ſupplied with oxygene air, ſo as to keep " the air better than atmoſpheric air, which was known " by dipping a candle into it, and obſerving that it " burned with a brighter flame. At the expiration of " the twenty minutes, C and D, which had breathed " atmoſpheric air, were immerſed in water till perfect " aſphyxia came on. At the inſtant they were taken " out, there appeared in both a motion of the lower jaw; " C began ſenſibly to recover, while D lay as dead: In " a minute and half, C roſe, and began to walk about " the room, ſtaggering at firſt, D being ſtill motionleſs " or nearly ſo; in this ſtate it continued for fifteen mi" nutes, when, for the firſt time, it raiſed itſelf, and im" mediately afterwards fell on its ſide.

" CHRISTOPHER MACHELL.
" RICHARD LOVELL EDGEWORTH.
" J. GUILLEMARD.
" JAS. SADLER.
" THOMAS BEDDOES.

" Kitten D died the next day."

Of the other ſimilar experiments, it is ſufficient to obſerve, that the reſult was always in ſome degree the ſame; ſometimes the unoxygenated animal failed to recover; it was generally noticed that the oxygenated ſhewed ſigns of life under water the longeſt; and ſometimes that it ſtruggled as much as ever after its oxygenated fellow had ceaſed to move. Thus, in an experiment, September 28, a whelp, which had reſpired atmoſpheric mixed with one-third of oxygene air for thirty-four minutes, is regiſtered to have been as much alive as before immerſion under water, another puppy of the ſame litter unprepared, and immerſed at the ſame time, having become motionleſs. Theſe facts illuſtrate the query concerning divers. To obviate any miſtake from difference of conſtitution, the experiment was ſometimes repeated upon the ſame pair of animals, one being oxygenated one day, and the other the next, or the day following. The water in which they were drowned, was ſometimes heated to the temperature of the body.

But as unequal quantities of liquid have been found to get down the wind-pipe of drowning animals, it ſeemed proper to repeat the experiment in another manner.—Accordingly, of two greyhound puppies of the ſame litter, ten days old, E the weaker was kept an hour and fifty minutes in a mixture of two thirds of atmoſpheric air, and one-third of oxygene air from heated manganeſe. F was left as uſual: Both were then immerſed in hydrogene air. F ſoon appeared much agitated, and expreſſed much uneaſineſs. E moved very little, and ſoon placed itſelf in the couchant poſture, with the head between the fore-legs and the muzzle reſting on the bottom of the veſſel. In five minutes, F was lying on its ſide, now and then breathing, which it did leſs and leſs frequently and more feebly. In ten minutes, this effort was ſcarce perceptible: In two minutes more, it was not once repeated. For the laſt ſix out of the twelve minutes, E was ſo perfectly ſtill, that we were diſpoſed to believe it dead; and a perſon preſent ſaid, " this experiment will turn out ill for oxygene." During theſe laſt ſix minutes, E had not inſpired at all; and from the firſt, the reſpiration was very infrequent.

At the end of the twelve minutes, both puppies were taken out of the hydrogene air; E immediately cried and ſtruggled, F being quite motionleſs. They were laid before a fire; E cried, moved, and ſoon walked as uſual; F ſeeming quite dead. In ſixteen minutes, a ſtream of oxygene air was blown into F's mouth, but no ſign of life appeared, The animal was afterwards opened; upon irritating the pericardium with a pointed knife, ſo as to preſs upon the heart, no movement followed; the pericardium being removed, the heart began to contract ſpontaneouſly; a ſtream of oxygene air being directed upon the heart, its action became more ſtrong and frequent; the number of ſtrokes was about ſeventy in a minute. The colour of the heart (probably from the filling of its own blood veſſels) changed from pale to red. The difference of colour in the tongues of theſe puppies was ſtriking even by candle light, after the experiment, that of E being much more ruddy. The following variation of the experiment ſeems worth tranſcribing from the journal: Of two puppies of the ſame litter, the weaker G was kept in atmoſpheric air mixed with one-third oxygene, and H for an equal time in atmoſpheric air with one-third hydrogene. Both were plunged into tepid water. H became motionleſs, while G moved with force, cried on being taken out, and ſeemed little affected.

The effect of oxygene air was very ſtriking in recovering H. It began to move, and reſpire the moment it was put into a veſſel containing this air.

It was ſometimes obſerved, that the movements of very young puppies under water, did not entirely ceaſe in leſs than fifteen minutes.

VI.—*Neceſſity of oxygene air to muſcular exertion.*

The blood in the veins is dark; in the arteries it is bright. When the reſpiration is ſtraitened, the arterial blood becomes darker; when acceſs of oxygene air is prevented, all the blood becomes dark. In drowned and ſtrangled perſons, the face, lips, the ſkin under the nails, and ſome other parts, are of a violet or dark blue colour. Here the blood can receive no oxygene.—There are a number of caſes on record, where, from bad conformation of the heart and adjacent great blood veſſels, part of the blood only paſſed through the lungs; the reſt paſſed in the dark diſoxygenated ſtate in which it returns from the veins, into the arteries again. Such perſons are always blue or livid. They are extremely feeble; in walking, are ſometimes obliged to ſtop every third ſtep, and cannot make any exertion of the muſcles without inſtant panting and wearineſs. They commonly die ſuddenly; you will find an account of ſuch individuals in *the Commentaries of the Inſtitution at Bologna.* Vol. 6, p. 64. *Philoſoph. Tranſactions*, vol. 55, p. 72. *Medical Obſervations and Enquiries, vol.* 6. in my *Medical Obſerv.* p. 62. *Abernethy's Surgical Eſſays, part* 2.—Perſons ill of ſea-ſcurvy, often drop down dead in making a ſudden effort, and from ſurprize. There is reaſon to believe, that either living in confined air, or on ſalted food, occaſions a deficiency of oxygene in the fluids and ſolids.

Hence, if a perſon were to keep quite ſtill, a given quantity of air ſhould ſerve him to breathe longer than if he exerted himſelf. Thus ſhould any perſons find themſelves again in the ſituation of Mr. Holwell and his fellow-ſufferers in the Black-hole priſon at Calcutta, their beſt chance of ſurviving would probably be to forbear vehement ſtruggles. The fever of the ſurvivors appears to have been occaſioned by the great ſtimulating power of freſh air, and of the ſenſations their eſcape muſt have occaſioned.

The following experiments render probable the expenditure of oxygene in muſcular exertion. Of two half-grown kittens of the ſame litter, one was teazed to make efforts for half an hour, and then put into an air-tight veſſel, in which it lived 48 minutes; the other lived 56 m. in the ſame veſſel; it would require more ſuch cruel experiments to decide whether ſpeedier death here aroſe from previous conſumption of oxygene by ſtrong muſcular action, and the ſubſequent neceſſity of a ſupply. It ſhould be obſerved, that the firſt animal was not reſpiring more deeply than the ſecond, at the time they were incloſed.

The following fact is remarkable, and countenances, but does not rigorouſly prove, the hypotheſis. A grown cat was incloſed in an air-tight glaſs veſſel. She immediately became furious to a degree beyond what I have obſerved in any animal under experiment. The violent agitation continued for 20 minutes. In 5 minutes more—25 minutes in all—ſhe appeared dead; ſhe was left in the veſſel two minutes longer, and proved to be quite dead. A lighted candle was immediately extinguiſhed on being introduced into the veſſel.

Into the ſame veſſel another cat of the ſame ſize and age nearly, to which a ſmall glaſs of white wine had been given half an hour before, was introduced. This cat ſate almoſt perfectly ſtill during the whole experiment. It lived 47 minutes, or nearly twice as long as the other.

In order to vary the experiment, half a glaſs of ſherry was given to a kitten nearly grown. It was *immediately* put into the ſame receiver; and ſet to *ſtruggle very violently*. It ſoon appeared to reſpire with difficulty. In 15 minutes the reſpirations were 98 or 100 in a minute. It did not reſpire after the 34th minute, and in 2 minutes more was taken out inſenſible.

A fellow kitten, no way prepared, was placed in the ſame receiver, and remained *very tranquil* for above a quarter of an hour; its reſpiration was never ſo frequent as that of the former; and it raiſed its head and breathed at the end of 41 minutes.

We have then

	Minutes.	Minutes.
An harraſſed kitten living	48	Difference 8.
Its fellow, not previouſly harraſſed,	56	
A grown cat not prepared, but furiouſly agitated, - -	25	Difference 22.
Another perfectly tranquil, having drank wine, - - -	47	
A large kitten immediately after wine, and violent, - -	34	Difference 7.
Its fellow tranquil without wine,	41	

In theſe ſix experiments the ſame veſſel, that is, the ſame quantity or air, was uſed. It may be ſaid, by a perſon unuſed to accuracy of terms, "no wonder the moſt exhauſted animals ſhould periſh ſooneſt." By conſidering a moment, he will perceive, that it is deſireable to know preciſely in what this exhauſtion conſiſts. I formerly conjectured that oxygene is conſumed faſter by an animal under the firſt operation of wine or other ſuch ſtimulants; and Dr. Withering afterwards adduced the experience of Mr. Spalding in confirmation of this conjecture. It is not ſo eaſy to make the experiment upon animals, the efforts of ſome under confinement being ſo much more violent than of others. The laſt experiment was made with a view to this queſtion, but the two preceding incline me to refer ſpeedier death in this inſtance to the violent ſtruggles, rather than to the wine.

VII.—*Another comparative experiment with an Animal charged with oxygene.*

Of two half-grown rabbits (K and L) of the ſame brood, colour, ſize, and apparent ſtrength, K was put into a large reſervoir containing atmoſpheric air with a little oxygene. After ſome hours it was taken out, and placed for an hour in a mixture of nearly equal parts of oxygene and atmoſpheric air. It did not ſeem to ſuffer in its reſpiration ; K and L, which latter had remained at large in the ſame apartment, were then incloſed in a veſſel, and placed in a freezing mixture. In 20 minutes ſome of the cold brine was poured upon the bottom of the veſſel in which the rabbits were : in 30 minutes L ſeemed affected, in 45 was ſcarce alive, and in 55 was quite lifeleſs, and frozen ſtiff. K ſeemed ſufficiently lively, only its feet were frozen ſtiff. They were dipped in cold water, and the animal recovered perfectly. I obſerved many convulſions and much tremor of the limbs during recovery. It was between 8 and 9 o'clock in the evening when the rabbits were taken out of the veſſel. K, by 12, had recovered the uſe of its forelegs, and being left not far from a dying fire within the fender, was found in the morning running about the room, when it eat cabbage leaves freely. It was kept alive for a week, when the legs appeared diſeaſed from too quick application of heat at firſt.

The experiment being repeated without admitting liquor into the receiver, the reſult was ſimilar. Would opium and wine enable an animal to reſiſt the freezing mixture, as oxygene does ?

VIII.—*Experiments with oxygene and other airs, largely diſtributed through the cellular ſubſtance.*

Dr. Maxwell, aſſiſted by Dr. Goodwyn and ſome other friends of accuracy and genius, forced different airs under the ſkin of animals, whence every perſon in any degree acquainted with anatomy, knows they would inſinuate themſelves far and wide through the body, in conſequence of the free communication between different portions of the cellular ſubſtance.—I. 4½ pints of *atmoſpherical air* were forced under the ſkin of a bitch, weighing 20lb.; the inciſion was cloſed by a ſuture: the animal appeared uneaſy and indiſpoſed for 36 hours; the puffing did not begin to ſubſide before the 9th day; on the 20th, no air was left except a little about the lower part of the belly.—II. 3 pints of air, in which a light had burned out, were forced under the ſkin of a dog weighing 13lb. For ſome hours the animal appeared ſtupid. The emphyſema or puffing ſeemed to decreaſe during the 3d day; on the 16th convulſions came on and frequently returned; on the 20th the dog died, much debilitated. In three other experiments nearly the ſame phænomena were obſerved.—III. 4 pints of oxygene air were infuſed in the ſame manner into another dog; ſlight uneaſineſs was obſerved for the firſt hour, and afterwards the animal appeared exceedingly lively (*maxima alacritas*). Next day the emphyſema began to leſſen; by the 10th all the air was abſorbed. In another dog of 19lb. 3½ pints of this air diſappeared in 8 days; in a third of 21lb. 3 pints in 8 days; in a 4th of 20lb. 3 pints nearly in 7 days. The 2d and 3d were affected as the firſt dog; the 4th was in no way affected.—IV. Carbonic acid air was infuſed into ſeveral dogs and rabbits. A large quantity (as much as 2 pints in a dog of 17lb) diſappeared during the operation; the reſt was gradually abſorbed in 4—14 days. No inconvenience followed, except in one caſe where a pint of air infuſed into a rabbit 3 months old, occaſioned uneaſineſs from diſtention; but even here the animal eat with a good appetite in half an hour. The inſtantaneous diſappearance of ſo much air in theſe experiments, was probably owing to its combination with the moiſture in the cellular ſubſtance.—Inflammable air (from metallic ſolutions, I ſuppoſe) occaſioned heavineſs and ſhivering in two dogs; 3 pints in one, 2½ in the other. Some detumeſcence was obſerved on the 4th day in both; in 13 days the air was all gone in the 1ſt, and in the 2d in 9 days.—VI. 2½ pints of nitrous air were infuſed into a dog of 28lb. It howled as if in exquiſite pain: in 15 minutes it ſtaggered as if drunk; then convulſions came on, and vomiting with involuntary excretions. In 30 minutes it lay enfeebled on the ground, making deep and laborious inſpirations, in 54½ it died, the convulſions continuing to the laſt.—The heart had all its cavities full, and was quite inirritable. The lungs were of a pale ſaffron colour, and ſhewed no veſtige of red blood. Brain in a natural ſtate. In another experiment 1½ pint of nitrous air produced the ſame effects, and death in 45 minutes. In neither caſe were the external muſcles inirritable. Rabbits died juſt as theſe dogs, and the ſmell of nitrous acid was perceived when the lungs were inflated and left to collapſe. In this theſis (Edinburgh 1787) Dr. Maxwell relates other experiments, in which airs were thrown into the blood-veſſels. By one (p. 22) he ſhews that elaſtic fluids do not prove fatal till they get into the cavities of the heart. But as theſe latter experiments ſuggeſt no concluſion concerning the medicinal power of elaſtic fluids, I need not conſider them at preſent. Mr. Achard of Berlin, was the firſt who publiſhed experiments with different airs injected into the cellular membrane. But Mr. Achard is a writer whom one can ſeldom quote with confidence.

IX.—*Experiments with hydrogene and other mephitic airs.*

Dr. Prieſtley, (*Exp. on Air, N. Ed.* I. 229,) ſays, "Inflammable air kills animals as ſuddenly as fixed air, "and as far as can be perceived, in the ſame manner, "throwing them into convulſions, and thereby occa"ſioning preſent death." Dr. Prieſtley does not ſay how he aſcertained the former part of this aſſertion, and I apprehend, it will be found erroneous, if it regard inflammable air from zinc or malleable iron with ſteam. Mr. Scheele could make 20 inſpirations without inconvenience; and I have ſeen ſeveral perſons breathe ſtill oftener from a tube through which a current of this air ſet, their noſtrils not being cloſed *(Letter to Dr. Darwin, p. 44)*. Hence I concluded that this bland air might with impunity be breathed unmixed, longer than any other mephitic air, except perhaps azotic. Dr. Macdonnel of Belfaſt, whoſe abilities and ſkill in phyſiological reſearches muſt be well remembered by all who ſtudied medicine at Edinburgh 8 or 9 years ago, confirms me in this opinion. " I have tried, (he informs me in a letter dated Auguſt 13, 1794), " hydrogen air " in five pulmonary caſes, in two of which it had a very " ſudden and a very favourable influence. In one of " the others the meaſles ſupervened upon phthiſis, and " ſeemed to decreaſe the firſt diſeaſe.—My patients " ſometimes reſpired hydrogen air for a minute and half " at a time; the more frequently they repeated the ex- " periment, the more eaſy did it become; but after 15 " or 20 inſpirations I always obſerved the face to grow " dark and livid. I am aſtoniſhed at the length of time " which man can breathe, and animals live in, hydrogen " air."

Dr. Gilby of Birmingham noted the following appearances, and immediately afterwards drew out this minute.

" *Hydrogene Air.*"

" A mouſe immerſed in hydrogene air—from water " and heated malleable iron—continued 30 ſeconds with- " out ſhewing any mark of diſtreſs; reſpiration then " became laborious; one minute 33 ſeconds from the " time of immerſion it inſpired; but it moved no more, " and when taken out, proved to be quite dead.

" *Fixed, or Carbonic acid Air.*"

" Another mouſe, immerſed in this air, was inſtantly " affected; and in 15 ſeconds was completely dead." A young wood pigeon, in hydrogene air, ceaſed to gape and move in 2 minutes 35 ſeconds. For 10 or 15 ſeconds it did not appear incommoded. Its fellow, in carbonic acid air, ceaſed to gape and move in 43 ſeconds. It ſhewed diſtreſs inſtantly on immerſion.

Young animals do not drown ſo ſoon as old.—Imagining, therefore, that young animals would afford a more ſenſible ſcale on which to meaſure the power of different mephitic airs, to extinguiſh life, I made the following experiment. A puppy, four days old, was put into a veſſel of hydrogene air from heated iron and water. It ceaſed to breathe and move twenty-two minutes afterwards.—Another puppy, of the ſame litter, was put into carbonic acid gas, it ceaſed to breathe and move in one minute and an half.—Comparative experiments of this kind require repetition; two apparently ſimilar animals may be tenacious of life in different degrees, from cauſes not yet diſcovered; moreover, if immediately before immerſion, one ſhould have inſpired, and the other expired, this might occaſion a wrong inference. By keeping animals, ſeemingly equal, in different unreſpirable airs, till all appearances of life in one or the other had ceaſed; then taking the ſurvivor out, ſuffering it to recover, and after ſome days drowning it again in that air in which its fellow had periſhed before, I hoped to determine this queſtion certainly for the ſubjects of experiment, and by analogy for all animals of the ſame claſs.

Accordingly, three rabbits of the ſame litter, ſeven weeks old, much about half grown, and weighing one pound and an half each were ſucceſſively immerſed in three different kinds of air. Dr. Gilby being preſent at this experiment alſo, noted the appearances at the moment they occurred.

Experiment I.—Rabbit X.

“ *In hydrogene from water and heated malleable iron.*

	Minutes,	Seconds,	after immerſion.
“ In	1	20	Moved about, in appearance little diſtreſſed.
	1	50	Began to breathe ſhort.
	2	0	Viſibly diſtreſſed.
	4	15	Much agitated.
	7	0	Taken out, breathing very ſhort and thick.
“ In leſs than	17	0	Completely recovered.
“ In	40	0	(Which was ſoon as food was offered,) began to eat.

“ Exp.

“ EXPERIMENT II.—RABBIT P.

“ *In hydrocarbonate air from hot charcoal and water, twice paſſed through water.*

	Minutes.	Seconds.	
“ In	0	25	Breathed ſhort, diſtreſſed.
	0	35	Violently agitated, continued ſo 15 ſeconds; inſpired at long intervals for ſome ſeconds: ſcarce alive.
“ After	1	30	No inſpiration or movement ſeen.
“ In	4	0	Taken out for dead—did not recover.

“ EXPERIMENT III.—RABBIT Q.

“ *In carbonic acid air, from heated chalk.*”

	Minutes,	Seconds, after immerſion.	
“ In	0	20	Strongly convulſed.
	0	35	Gaſped at intervals.
	0	49	Has continued gaſping.
	1	0	Nearly dead.
	1	15	Quite dead.
	2	0	Taken out, perfectly lifeleſs, did not recover.

EXPERIMENT IV.—RABBIT R.

At the time of making theſe experiments I had not pure azotic air at command, and had neglected to uſe it when I had; the following obſervation makes it highly probable, that this air is not more ſuddenly deleterious than hydrogene. A candle having burned out in a veſſel full of atmoſpheric air in contact with lime water, a very ſmall kitten (about 14 days old) was put into the ſame portion of air; after the death of this kitten, which did not happen in leſs than 3 hours, the fellow of the three preceding rabbits was introduced; the following were the appearances:

Minutes.

Minutes.	
1	Breath ſhort—turns round.
3	In no great diſtreſs, breath ſhort.
5	The ſame.
7	Breath ſhorter.
10	Reſpiration apparently more laborious.
12	Taken out—very ſoon recovered—a candle plunged into the veſſel was immediately extinguiſhed.

Experiment V.—Rabbit X *again.*

In hydrogene air, at the interval of ſeveral days.

	Min.	*Sec.*	
	——	——	At firſt very tranquil.
In	2	0	Snuffs for air round the ſides of the veſſel.
	4	0	Reclined almoſt on its ſide.
	5	30	Breathes thick—very weak.
	6	10	Taken out, breathing thick,
	7	10	Could ſit.
	8	0	Could move, though ſtill weak.
	9	30	As uſual.

Experiment VI.—Rabbit X *a third time.*

Recent hydrocarbonate, prepared without ſuperfluous ſteam, at the interval of two days.

——	——	Diſtreſſed the moment of immerſion.
0	20	Scratched the veſſel furiouſly.
0	25	Fell on its ſide.
0	35	Motionleſs and inſenſible—taken out.
——	——	Lay as dead ſome time; finally recovered,

Another rabbit of the ſame brood, (before immerſion in water, viſibly much affected with fear) ſtruggled with ſtrength for a minute and an half. At the end of two minutes, forty ſeconds, it moved: in 3 minutes was taken out, but did not recover.

Should theſe experiments be repeated by a perſon, careful to procure his elaſtic fluids free from offenſive acid fumes, the diſtinctneſs of the phaenomena I obſerved, perſuades me that their general reſult will be confirmed. Of ſome readers, whom the importance of the ſubject may lead to take up this pamphlet, the curioſity will, I fear, be repreſſed by ſenſations, ariſing from the idea of pain endured by the animals. In a few caſes, the torture which was inflicted was exceedingly repugnant to my own feelings; and for this reaſon, I have left one ſeries of experiments (SECT. VI.) more incompleat than I could eaſily have rendered it. Againſt drowning, an imputation of cruelty will hardly lie: Animals, deſtined to this death, may juſt as well drown for the inſtruction of the phyſician. Beſides, did not accuſtomed acts of outrage and injuſtice daily paſs uncenſured, I know not how he who feeds upon the fleſh of a ſlaughtered animal can, upon reflection, condemn inveſtigations, ſeriouſly tending to reſtore or preſerve health, though conducted at the expence of the life and eaſe of animals, unable to reſiſt the power of man. I wiſh, with all my heart, I could prove that moroſe writer in the wrong, who has called the Earth A VAST FIELD OF BATTLE, where creature, for preſervation, preys upon creature, or tortures its fellow in purſuit of pleaſure.

Two kittens immerſed, one in carbonic acid, the other in hydrogene air, afforded a ſimilar reſult; that is, the carbonic acid appeared full three times as deleterious as hydrogene.

Finally, to render the difference again more diſtinct, two equal quantities of atmoſpheric, were ſucceſſively mixed with an equal bulk of carbonic acid, and of hydrogene, air. A rabbit S being put into the mixture of atmoſpheric and carbonic acid air; the following obſervations were made.

	Minutes.	
In	2	Appeared weak.
	4	Has been couchant for 2 minutes.
	6	Very ſtill.
	11	Reſpiration more laborious.
	26	Extremely weak; ſeems ready to fall on one ſide; ſcarce alive.

43 Quite dead.—After the 2d minute it never roſe—death very lingering.

A fellow rabbit, T, in atmoſpheric and hydrogene air, ſeemed much leſs diſtreſſed at firſt; rubbed its fore-feet after it had continued in the veſſel 40 minutes, and performed ſeveral other actions; much of the time it ſate, that is, it continued erect before. Even at the laſt, no diſtreſs, except quick reſpiration, was obſervable.

In 48 minutes it was taken out; it now ſtood firm; and though unwilling to move, was capable, when urged forward, of advancing, without ſtaggering, or any ſign of great debility. In appearance it had ſuffered leſs in 48 than its fellow in 15 minutes.

Reflections on the preceding facts.

The attentive reader muſt have ſeen, even in the reſult of theſe ſimple extemporaneous experiments, indubitable proofs of the power of factitious airs to affect the living frame. It appears that oxygene air, when inſpired pure, or nearly ſo, increaſes all the internal motions ſo as to produce dangerous or mortal inflammation; that by reddening the blood, it brightens the colour of the ſolid parts; even that of the liver, which anatomy ſhews to be the leaſt likely of all the ſolids to be affected by any change of the arterial blood: that it renders animals leſs capable of being drowned or deſtroyed by cold; that it is expended in muſcular motion, ſince animals that have exerted themſelves violently, immediately before confinement in a given quantity of atmoſpheric air, or during confinement, ſooneſt exhauſt it of oxygene; and that, when it is blown into dogs, in the manner veal is blown by butchers, it produces a remarkable degree of vivacity. Theſe facts, compared with ſome of the obſervations, which will be given in the next paragraph, will prove of uſe in directing us how to apply this air properly as a remedy.

Between the unreſpirable airs, there ſeems a remarkable difference in their power to produce inſenſibility and death. Hydrogene appears the leaſt noxious, both when inſpired alone, or mixed with atmoſpheric air. Azote probably differs little from hydrogene. Hydro-carbonate ſeems extremely deleterious; Mr. Watt gives evidence

of

of this in the human ſpecies. I can add a ſimilar obſervation. A perſon in confirmed conſumption breathed a quantity of hydrocarbonate, mixed with 4 times its bulk of atmoſpheric air: he became very ſick, or rather vertiginous; the pulſe was much quickened, and the extremities became very cold. The patient finding an abatement of pain in his ſide, and of dyſpnoea, returned for another doſe. The perſon who prepared this air, is one of the moſt ſkilful chemiſts, and moſt celebrated mechanical philoſophers in Great Britain. Thinking the former doſe too ſtrong, he now mixed 50 c.inches of hydrocarbonate with 600 of atmoſpheric air. This was reſpired without any ſenſible effect. In a quarter of an hour, 100 c. i. of hydrocarbonate were mixed with 600 of atmoſpheric air. The patient breathed at twice about two-thirds of this mixture, when he was deſired to deſiſt. Soon afterwards he became vertiginous and nearly inſenſible, his pulſe at one period being nearly imperceptible; the ſphincter of the bladder was relaxed; after his recovery, he was again very cold, " intenſely cold to his own feelings" was his expreſſion, as well as to the touch. After getting into his carriage, he fainted; and his pulſe for ſeveral hours continued quicker and weaker than before. The operator having obſerved, that when much water is added to red-hot charcoal, carbonic acid air is copiouſly produced, in the preparation of this laſt portion of air, had added ſo little water, that no ſuperfluous ſteam at all came over; hence it was as pure as can be made: being alſo newly prepared, it retained all the charcoal it had carried up; of which it is well known to depoſit part on ſtanding. This leads me to conjecture, that the greater deleterious power of heavy inflammable air from water and hot charcoal (hydrocarbonate) compared with that of light inflammable air, depends on the facility of its combination, or at leaſt of the charcoal it contains with the oxygene of the blood; in conſequence of which, it ſpeedily diſarms the ſyſtem of its moving principle, and induces lifeleſsneſs. This opinion is countenanced by the effect of nitrous air, which more quickly deſtroys life than any of thoſe above-mentioned, and which is well-known very readily to combine with oxygene.

Inſtantaneous death, in this caſe, may be imputed to the inſtantaneous production of an highly corroſive acid (nitrous acid) and its application to the whole ſurface of the lungs. And this hypotheſis may be thought to be corroborated by the *rapid* effect of carbonic acid air in occaſioning death, for which I confeſs myſelf unable to aſſign any plauſible chemical, or phyſiological reaſon. In the mean time, the facts I have related, oblige me to reject the opinion of thoſe eminent philoſophers, who have of late ſuppoſed that water and ſeveral bland unreſpirable airs produce death, ſimply by excluſion of the oxygene of the atmoſphere. Whether it be that ſome rob the body of this principle, and others exhauſt the ſenſorial power by an unknown operation, their action is certainly unequal; and I preſume, recovery from aſphyxia in water (when but little goes down the wind pipe), hydrogene air, azote, or from ſtrangulation (where no material injury from violence is produced), will be much more eaſy than from aſphyxia, occaſioned by other unreſpirable mediums.

Experiments to diſcover the effects of the long continued action of aeri-form ſubſtances, would be much more curious than ſuch as I have made. They would thus, in all probability, more deeply and permanently affect the living ſyſtem. If, for inſtance, an animal were kept in an atmoſphere containing $\frac{20}{100}$ $\frac{24}{100}$ of oxygene or ſtill leſs, it would perhaps be affected by the ſea ſcurvy. Again, if three equal growing animals were kept, one in the atmoſphere, the other in air of an higher, the third of a lower, ſtandard, and in all other reſpects treated alike; ſome conſiderable difference would perhaps be obſerved in their growth and vigour. By frequent immerſion in water, the aſſociation between the movements of the heart and lungs might perhaps be diſſolved; and an animal be inured to live commodiouſly for any time under water. If any plan, ſimilar to that of which I have attempted the outline, ſhould be executed, ſuch proceſſes of inveſtigation ought to be carried on in the Inſtitution.

XI.—*Some effects of the inſpiration of hydrogene, to elucidate the reſult of the foregoing experiments.*

" When an animal is immerſed in water, *his pulſe becomes weak and frequent*, he feels an anxiety about his

" breaſt, and ſtruggles to relieve it: in theſe ſtruggles,
" he riſes towards the ſurface of the water, and throws
" out a quantity of air from his lungs. After this, *his*
" *anxiety encreaſes, his pulſe becomes weaker*; the ſtruggles
" are renewed with more violence; he riſes towards the
" ſurface again; throws out more air from his lungs, and
" makes ſeveral efforts to inſpire; and in ſome of theſe
" efforts, a quantity of water commonly paſſes into his
" mouth; *his ſkin then becomes blue, particularly about*
" *the face and lips*; *his pulſe gradually ceaſes*; *the ſphinc-*
" *ters are relaxed;* he falls down without ſenſation,
" and without motion" *(Dr. Goodwyn, l. c. pp 3, 4.)*
This deſcription of drowning in water applies, as far as the circumſtances admit of compariſon, to the effects occaſioned by the reſpiration of pure hydrogene. I have remarked them in a number of healthy perſons, who were curious to try how long they could breathe this air. The frequency and debility of pulſe, blueneſs of the lips and coloured parts of the ſkin, were always obſervable in a minute, or a minute and an half. Beſides, dizzineſs was felt, and the eyes have grown dim; in animals, the tranſparent cornea has appeared ſunk and ſhrivelled. Several individuals agree in deſcribing the incipient inſenſibility as a ſtate highly agreeable. One conſumptive perſon loved to indulge in it; for this purpoſe contrary to my judgment, he uſed to inſpire a cubic foot of hydrogene at a time. This quantity moſt commonly produced little change in his feelings. Sometimes it brought on almoſt compleat aſphyxia. During this proceſs, I have felt the pulſe nearly obliterated. Afterwards, as he recovered, it was ſenſibly fuller, and ſtronger than before the inſpiration. This fact belongs to a general principle now beginning to be underſtood; when the ordinary powers have been, for a certain time, withheld from the body, they act with greater effect, as holding the fingers to the fire after handling ſnow, occaſions ſevere aching. For this reaſon, whenever air with leſs oxygene is to be inſpired, it would ſeem more advantageous to employ for a long time an atmoſphere little reduced, than one ſo low that it can only be breathed for a ſhort time.

An obſervation the patient juſt mentioned, made upon himſelf, ſeems to ſhew the neceſſity of oxygene to muſcular action. Judging from his feelings, that he was perfectly recruited after his doſe of pure hydrogene, he has riſen from his ſopha with an intention to walk about his apartment, but has been ſurpriſed on riſing, to find himſelf incapable of advancing three ſteps, till he had reſted ſome time longer. In this caſe, was not the ſtore of looſely combined oxygene, laid in before, expended during the inſpiration of the hydrogene, by thoſe motions which are perpetually going on in the ſyſtem? Did it not require ſome time to replace the neceſſary portion in the muſcles, remote from the heart and lungs?

XII.—*Some particulars relative to oxygene, ſupplemental to the preceding experiments.*

The celebrated Dr. Ingenhouſz in a letter dated Auguſt 4th, 1794, mentions to me a very curious experiment, "which," ſays he, "if it be a real fact, throws "a great deal of light upon your ſyſtem; it is this:— "Bliſter your finger, ſo as to lay bare the naked and "ſenſible ſkin. The contact of air will produce pain: "put your finger into vital air, and this will give more "pain; introduce it into fixed or azotic air, and the "pain will diminiſh or ceaſe." Dr. Webſter, he adds, was informed of theſe circumſtances, by a Frenchman, whoſe name does not appear; I had often heard them indiſtinctly related; and it is rather ſurprizing that the fact has not been aſcertained. Much of the art of modern ſurgery conſiſts in keeping the air from wounds and ſome kinds of ulcers: and this fact, if the account be true, pretty deciſively ſhews which ingredient of the atmoſphere is injurious.

I applied a bliſter an inch long, and half an inch broad, to the back of the third finger of the left hand. When the pain from the action of the cantharides had entirely ceaſed, I cut away the ſcarf-ſkin of the veſication; and was ſenſible, the moment the air was admitted, of a ſharp ſmarting pain. This did not continue ſo ſevere; but the expoſed true ſkin ſenſibly ſmarted. Upon tying the neck of a bladder, containing carbonic acid air from heated chalk, round the root of the finger, the pain very ſoon ſubſided. While I kept my finger in carbonic acid air, which was near half an hour, I ſhould not have known it had received any injury. On taking it out, the ſurface had a whitiſh appearance—Was this from the beginning of the formation of epidermis?—In the air—the experiment was made in a warm temperature—the ſmarting returned; in an hour the expoſed ſkin was painful and looked angry, as the expreſſion is: I again incloſed it in carbonic acid air; in ſix minutes I felt no more pain. After ſeveral hours I again removed the bladder, and ſoon felt the ſmarting return.

During the hour after my finger had been for the firſt time taken out of the bladder, I had introduced it into a phial of oxygene air, for a few minutes, but was not ſenſible of increaſe of pain; nor can I ſay that the redneſs and angry appearance was owing to this circumſtance.

At Oxford, in 1790, I had propoſed to a diſtreſſed negro, to try to whiten part of his ſkin with oxygenated marine acid air. He was to exhibit the appearance, if it ſhould be curious, for the relief of his family. His arm was introduced into a large jar full of this air, and the back of his fingers lay in ſome water impregnated with it at the bottom of the veſſel. It was perceived that he had ulcerations from the itch between his fingers; and this made me very cautious about the experiment. In 12 minutes he complained of ſevere pain from the ulcers, and the arm was withdrawn. The back of his fingers had acquired an appearance as if white lead paint had been laid upon them, but this did not prove permanent. A lock of his hair was whitened by this acid.—Next day the ulcers became extremely painful, and the hand ſwelled from the inflammation; this deterred him a continuance of the experiment after he was cured of his complaint. You cannot ſafely impute the effect of this powerfully ſtimulating acid to its oxygene alone.

But the fact ſtated by Dr. Ingenhouſz is very agreeeable to the common phænomena preſented by wounds. Moreover, I have lately ſeen cancerous patients treated by the application of unreſpirable air, with the moſt aſtoniſhing ſucceſs. In mentioning to Dr. Black the introduction of factitious airs into the BATH hoſpital, as a ſource of hope, I did not ſo ſoon expect an event which ages and nations have deſired in vain. Obſervations, extremely analogous to the reſult of my ſingle experiment with carbonic acid air, were there made during the courſe of the treatment, of which the phyſician who employed it will ſpeedily give a particular account to the public, Should it be invidiouſly obſerved by any reader of his narrative, that ſomething ſimilar had been tried before, it may be truly replied, that theſe trials were rather diſcouragements to the new application of elaſtic fluids; and that failure in former inſtances enhances the merit of the recent method.

While this ſection was printing, I made the following experiments: The raiſed epidermis of a bliſtered finger, after all action of the cantharides had ceaſed, was cut away in carbonic acid air. No pain was felt. The atmoſpheric air ſlowly mixed with the other in the glaſs cylinder, as I found by the dull manner in which a candle burned in it; and now ſome ſlight pain was felt. The finger being put into oxygene air, a ſmarting came on, and laſted 20 minutes; but now became leſs. The finger was next put into air containing alkaline fumes; and the pain was much ſeverer than ever. A 2d bliſter being opened in the air, ſmarting pain came on. In a bladder of fixed air it ſoon went off. The epidermis was cut off from a bliſter on my own finger, which I inſtantly plunged into oxygene air; it felt as when ſalt is ſprinkled on a cut: and the pain was, I am pretty ſure, more ſevere than when my former bliſter was opened in the atmoſphere. In carbonic acid air the pain in two minutes quite ſubſided, and returned when I expoſed the bare ſkin to the atmoſphere.

XIII.—*Of the preparation of atmoſpheres of different ſtandards.*

Perſpicuity in the directions, which cannot for all readers be attained in *reaſonings*, being a principal object in the preſent pamphlet, it may be uſeful, before I proceed, to exhibit a view of thoſe mixtures which furniſh atmoſpheres of an higher or lower ſtandard, than the common air. By *an higher ſtandard*, I mean more than 28 parts of oxygene in 100; by *a lower ſtandard*, leſs. For the ſake of brevity, we might ſay, *air of the ſtandard of thirty ſix*, inſtead of "air containing thirty-ſix parts of oxygene in an hundred parts."

Mr. Watt's hydraulic bellows furniſh the means of throwing any proportions you pleaſe of the different airs into a common reſervoir. The effect, as far as can be ever uſeful in practice, is ſhewn in the following tables:

Change of the ſtandard of atmoſpheric air, by addition of other airs.

The ſtandard of atmoſpheric air being 28 oxygene, 72 azote, it is altered in this manner, by the addition of ſucceſſive equal parts of atmoſpheric to one of oxygene:

		Oxygene.	*Azotic.*
1 part of atmoſpheric	to 1 of oxygene	64	36
2 of atm.	to do.	52	48
3 do.	to do.	46	54
4 do	to do.	42	58
5 do.	to do.	40	60
6 do.	to do.	38	62
7 do.	to do.	37	63
8 do.	to do.	36	64
9 do.	to do.	35	65
10 do.	to do.	34½	65½
11 do.	to do.	34	66
19 do.	to do.	30½	69½

N. B. Small fractions are neglected.

The ſtandard is altered in the following manner, by addition of ſucceſſive equal parts of oxygene to one of atmoſpheric air:

		Oxygene.	*Azotic.*
2 oxygene	to 1 atmoſpheric	76	24
3 oxygene	to do.	81	19
4 do.	to do.	85	15
5 do.	to do.	88	12

Reſpecting theſe two tables, it is to be obſerved, that the moſt ſkilful chemiſts have never been able to obtain oxygene air quite pure; it may therefore be allowed, that in ſuch as will commonly be prepared, not more than 80 or 85 parts in 100 will be pure oxygene; unleſs it be prepared from good manganeſe and rectified vitriolic acid; of this waſhed in lime-water, ſcarce 10 parts in 100 will be unreſpirable. The unreſpirable air, with tolerable care, will be obtained free from oxygene. The following proportions, therefore, will be more exact than the foregoing:

Effect of the addition of different portions of atmoſpheric to one of unreſpirable air.

		Oxygene.	*Unreſpir.*
1 atmoſpheric	to 1 unreſpirable	14	86
2 do.	to do.	19	81
3 do.	to do.	21	79
4 do.	to do.	22	78
5 do.	to do.	23	77
6 do.	to do.	24	76
7 do.	to do.	24	76
8 do.	to do.	25	75
9 do.	to do.	25	75
10 do.	to do.	25½	74½

Effect of the addition of different portions of unreſpirable airs to one of atmoſpheric.

1 atmoſpheric	to 2 unreſpirable	9	91
1 do.	to 3 do.	7	93
1 do.	to 4 do.	5½	94½
1 do.	to 5 do.	5	95

It ſeems not improbable, that on certain ill-conditioned ulcers, oxygene has a ſalutary effect, by occaſioning greater action, both of the veſſels which throw out the copious thin diſcharge, and of the abſorbents. Many ſubſtances, uſually applied to ſuch ulcers with ſucceſs, as metallic ſalts, contain much oxygene, and ſome are moſt highly charged with this principle, as the red oxyds of metals. The following intelligence, if authentic, adds confirmation to this opinion, and may prove uſeful: A few months ago, I was ſtruck with the frequency of ſcrophulous tumors among the poor of the county of Longford, in Ireland. Suppoſing that neceſſity might have occaſioned the trial of many methods of cure, I enquired whether the people there had not ſome peculiar domeſtic practices in ſuch complaints. A phyſician referred me to a ſimple but very reputable old farmer, as remarkably ſuccefsful in ſcrophulous ſores. With this perſon I had an interview. In his practice, he had no view to gain; and that, in his principles, he had nothing of empirical impoſture, he convinced me, by at once diſcloſing all his art. He had himſelf, many years ago, an ulceration of the ſubmaxillary glands: This, after various unſuccefsful applications, was healed by a ruſtic practitioner like himſelf. He obtained a knowledge of the remedy, by which, during a long life, he aſſured me he had himſelf healed many ſuch ulcers of the glands about the jaws. He was ſo little ſpeculative, as never to have attempted the cure of an obſtinate ſore in any other ſeat. That he might effectually inſtruct me, he brought ſpecimens of his ſimples. They were the leaves and ſtalks of wood-ſorrel *(oxalis acetoſella)*, and the root of meadow-ſweet *(ſpiraea ulmaria)*. The ſorrel he prepares by wrapping it in a cabbage leaf, and macerating it by its own juices in warm peat aſhes. This pulp is applied like a poultice to the ulcer, and left 24 hours; the application of ſorrel is four times repeated; then the roots of the meadow ſweet, bruiſed and mixed with the ſour head or efflorefcence that appears on butter-milk, left in the churn, are uſed in the ſame manner till the ſore heals, which I was told always ſpeedily happens, often in 2 or three weeks.

The following extract of a letter from Mr. Edgeworth, of Edgeworthſtown, contains ſome ſupplementary information, and will probably add ſo much to the credit of my information, as to obtain a trial for the remedy.

" I have learned from Mr. Mills, that when he was about eight and twenty, he had two large ſcrophulous ſwellings in his neck, one under each ear, near the jaw; the marks they had left he ſhewed me. He was attended by a ſurgeon in the neighbourhood for ſome weeks, without receiving any benefit. A farmer, with whom he was acquainted, recommended the application he mentioned to you, by which he was completely cured. The man told him the names and quantities of the ſeveral ingredients,

dients, when he applied them, but did not till ſome years afterwards (when he was leaving this country for America) apprize him that the *myſtery of the cure* (that was his expreſſion) depended entirely upon the ſorrel. This perſon had predicted to Mills, that one of the ſores, which had been lanced, would not heal ſo ſoon as that which had ſuppurated of itſelf; and he found this to be true. Whilſt he had ſcrophulous ſwellings, he was weak and unhealthy; from the time the wounds were healed, he has been ſtrong and active; he is now eighty; and whilſt he was relating theſe circumſtances to me this evening, he kept pace with my horſe up hill for half a mile, without any apparent effort. I mention this, becauſe it is a common opinion (I ſuppoſe a vulgar error) that healing ſuch ſores is prejudicial to the general health. He has applied this remedy to upwards of an hundred different perſons, every one of whom have been cured.—Seven years ago I remember having ſeen his ſon, who rents a conſiderable farm from me, with an enormous ſcrophulous ſwelling on his neck; he was in great pain, was weak, and emaciated; he was too impatient to wait for a ſuppuration of the ſwelling, and would have the plaiſter applied to it whilſt it was unbroken; the cure was protracted, but was effectual; he has had no return of the complaint; a ſlight inequality of ſurface ſtill remains upon his neck. Mr. Mills has communicated his recipe to ſeveral, and in particular to a very intelligent perſon in this neighbourhood, who has employed it with unfailing ſucceſs. All the patients complain of the ſeverity of the application; and in every ulcer to which it is applied, there takes place a remarkable change from a dead pale to a bright ſcarlet colour." *July* 17, 1794.

This change of colour indicates communication of oxygene, which perhaps the oxalic acid of the ſorrel contains in ſuch a ſtate of combination as eaſily to part with a portion. Now Dr. Darwin, in his ZOONOMIA, attributes ſcrophulous ſwellings of the glands to inirratibility, which, as I have conjectured, may ariſe from a certain deficiency of oxygene. Theſe principles would ſupply an obvious theory, were we but certain of our facts. If however, as the preceding account implies, ſorrel produces detumeſcence of the glands before ſuppuration, its application will be, I ſuppoſe, a more eligible practice than any now in uſe. Writers in the Materia Medica may have applied *deobſtruent*—their word of courſe—to this plant, but I remember no particular commemoration of its virtue in ſcrophula. Murray, a compiler of extenſive reading, has nothing to this purpoſe.—(*Apparat. Medicam.* III. 492-9).

XIV.—*Of the method of procuring elaſtic fluids.*

To procure a doſe of factitious air by means of Mr. Watts' apparatus will, I think, be found quite as eaſy as to dreſs a joint of meat. In two inſtances under my eye, a ſervant of good plain underſtanding, has managed the apparatus perfectly. One failed at firſt for want of making the charge in the caſt iron pot red hot, before he let the water drop. Hence he got ſteam inſtead of air. When the joints are made tight, and the heat is proper, and the water does not drop too faſt, the operation proceeds perfectly well. Mr. Watt gives a ſufficient variety of lutes. A ſtrip of oiled ſilk bound faſt round a joint, alone makes a good lute and will bear much heat.

I was for ſome time anxious concerning oxygene air. Expecting this would be full as extenſively uſeful in medicine, as any unreſpirable air, I wiſhed for a method equally ſimple of procuring it. Knowing that the manganeſe from the Mendip hills gives 1. azotic, 2. oxygene, 3. azotic with carbonic acid air; ſo that the whole product is not much ſuperior to the atmoſphere, I feared leſt inexperienced operators ſhould be incapable of catching the beſt part of the produce. I therefore, at the ſuggeſtion of Mr. Hermbſtaedt and Mr. Chaptal turned my attention to the ſolution of manganeſe in vitriolic acid. Mr. Hermbſtaedt had found a pound of the Ilefeld or Ilmenau manganeſe, with ſtrong vitriolic acid, to yield 3384 cubic inches of "the beſt oxyygene air."—(*Hermbſtaedts Verſuche*, B. II. p. 49.) Mr. Chaptal obtained full as much from French manganeſe. I procured 150—200 c. i. of oxygene air (which by the nitrous teſt proved excellent) from oil of vitriol and 1 oz. Exeter manganeſe. But when I lately came to make experiments with a view to diſcover a proper method for common practice, I perceived that this proceſs was highly objectionable. The firſt portions of air procured by means of the oil of vitriol of commerce contained much oxygenated marine acid air—a ſpecies of elaſtic fluid exceedingly deleterious and irritating to the lungs. This happened becauſe ordinary oil of vitriol is contaminated with muriatic acid. Beſides, as the acid of vitriol will itſelf be carried up by the heat neceſſary to extricate the air by this operation, the veſſels will ſuffer from corroſion, unleſs troubleſome precautions are employed. The air itſelf too will not eaſily be totally freed from the pernicious acid fumes. Hence, contrary to my firſt intention, I ſhall omit directions for procuring oxygene air from oil of vitriol and manganeſe; they are further become unneceſſary, ſince Mr. Watt's apparatus anſwers perfectly well for this alſo, according to his laſt directions. The ſkilful chemiſt, who may chooſe to procure it in this way, will be ſufficiently apprized of the neceſſary precautions, For others it is added, that the Exeter manganeſe is in no reſpect preferable to any other, which does not contain much calcareous earth, or ſome noxious mineral, which latter is not the caſe with any manganeſe I know. To diſcover whether the manganeſe you are about to uſe contains calcareous earth, pound it coarſely, and put it into a glaſs containing a little water. When it is moiſtened, add ſome nitrous acid. If a conſiderable working or effervefcence takes place, the manganeſe contains calcareous matter. Strong vinegar will do tolerably well inſtead of nitrous acid; ſo will weak vitriolic acid. But ſpirit of ſalt or muriatic acid is not proper. Examined in this way, the Mendip manganeſe effervefces much, the Exeter not at all.

Should you wiſh to procure for breathing carbonic acid air by ſolution of chalk, I would adviſe the uſe of vinegar inſtead of vitriolic acid. When the chalk is coarſely pounded, ſo as to leave no bits larger than peaſe, you will have a continued effervefcence from common vinegar mixed with about an equal bulk of water. You will avoid thoſe offenſive ſulphureous fumes which vitriolic acid gives out. If Nooth's glaſs apparatus is uſed upon ſuch occaſions, put a pint of water in the middle veſſel, and add to it half an ounce of ſalt of tartar or of ſoda.—To impregnate hydrogene air with zinc, I have thought it ſufficient to put a few ounces of zinc (which in the ſhops is called *ſpeltre*) into the pot, the reſt of the charge being of iron.

XV.—*Hints for the uſe of unreſpirable airs.*

I cannot pretend to lay down any rules, founded upon large experience, for the employment of unreſpirable airs in medicine. It was not in my power to adminiſter theſe in quantity till late in June 1793. It could not be expected that great numbers would immediately have recourſe to a new method, not recommended by any of thoſe arts by which the credulous are deluded; and I had no hoſpital at command. Of the interval (ſince the middle of 1793) part has been ſpent in abſence, and part employed about the means of putting the public in poſſeſſion of ſuch an air apparatus as could be generally uſed. I have, however, acquired the knowledge of ſome facts, and the right of giving ſome cautions.—One part of hydrogene (and probably of azote) may be freely employed from the firſt, with three or four parts of atmoſpheric air. Of this mixture ſuppoſe the patient to inſpire for a minute; then to attend to his feelings. By degrees he may prolong the time of inſpiration, and increaſe the proportion of hydrogene; but ſhould not in any chronic complaint uſe more than an equal portion of hydrogene. In that claſs of diſeaſes, where a diminution of action is required, theſe airs may be uſed with high probability of advantage, particularly where the lungs are inflamed. I have ſeen a conſiderable inflammation of the lungs, with pain, full pulſe, and fluſhed countenance, inſtantly relieved by a mixture of one part of hydrogene, and about ſix parts of atmoſpheric air, inſpired for a quarter of an hour. One of my friends, who, I hope, will publiſh the particulars, adminiſtered air of a reduced ſtandard to a child, violently affected by the croup. The child was at firſt unwilling to inſpire; but being prevailed upon, his countenance ſoon manifeſted the relief he experienced, and his ſkin felt cooler, while he was inſpiring. The diſeaſe from this time abated; and after a repetition of the means, the child recovered. Phthiſical patients, even ſuch as have been in the laſt ſtage, have many times atteſted to me, that hydrogene mixed with common air allayed their diſtreſſing heats. I have reaſon to believe, that by inſpiring this mixture once or twice after going to bed, the night fever and ſweat may be prevented. For this purpoſe, the patient ſhould take from half a cubic foot to a cubic foot of hydrogene mixed with common air, before he falls aſleep, and after awaking for the firſt time.

In the opinion I formerly advanced concerning the ſoporific virtue of a reduced atmoſphere *(Obſervations on Calculus, p.* 80*)*, I am ſomewhat confirmed by ſubſequent occurrences. A perſon in conſumption, who, for months, had taken opium at night, on breathing hydrogene freely, could ſleep perfectly well without opium. He remarked, that his ſleep was more profound than uſual. The air of his room being largely mixed with hydrogene, his ſervant neceſſarily inſpired much of it. The man had been accuſtomed to reſt ill; and now ſpontaneouſly remarked, "that he did not know what was "come to him, he ſlept ſo found."

At firſt I have thought hydrogene air to impair the appetite. But the effect has not been permanent. Hydrogene from ſolution perhaps produces nauſea by its diſagreeable ſmell.

Carbonic acid air ſhould not be uſed at firſt in greater proportion to atmoſpheric than from $\frac{1}{9}$ to $\frac{1}{6}$. I have been ſurpriſed that this acid air ſhould have proved ſo grateful to the lungs. I have never ſeen or heard of its exciting pain or coughing in confirmed conſumption.—It has even inſtantaneouſly relieved phthiſical dyſpnoea in ſeveral caſes, which other unreſpirable airs have done alſo. The facts related in Sect. XII. will perhaps help to ſolve the difficulty concerning the mild action of carbonic acid on ulcerated lungs. This acid air, during the day, and hydrogene at night (to prevent fever), may, I think, be uſefully combined.

The uſe of hydrocarbonate air requires repeated precautions. Though this appeared not at all more ſuddenly deleterious than carbonic acid to animals immerſed in theſe fluids, it produces a much more powerfully depreſſing effect, when inſpired in mixture with atmoſpheric air: 100 cubic inches of hydrocarbonate with 1200 of atmoſpheric, breathed at ſhort intervals, have ſenſibly weakened patients, who felt no ſuch effect from 100 of carbonic acid, with 600 of atmoſpheric, air. The extremities have been remarkably chilled by the firſt mixture. The debilitating power of hydrocarbonate is ſo extraordinary, that it may perhaps be the far-famed miaſma of the marſhes. *This air ſhould not at firſt be inſpired with leſs than* 12, *or perhaps* 15, *times its bulk of common air.* A medical gentleman, upon witneſſing ſome of its effects, imagined it would be particularly uſeful in the ſtrangulated hernia. In this moſt painful and dangerous diſorder, any unreſpirable air, given ſo as to produce ſome vertigo and faintneſs, promiſes to be uſeful. Though, according to the ſcholaſtic adage, *it is eaſy to add to inventions*, and purſue analogies, I have ſingled out this idea as not extremely obvious.

No cautious thinker can, without long experience, feel aſſured that he has been highly ſucceſsful in preventing imminent conſumption. A lowered atmoſphere has, however, evidently appeared to me to effect this where common remedies afforded little hope. To one ſtate, previous to conſumption, this remedy, judiciouſly managed, ſeems peculiarly applicable. It is where the lungs are affected with a ſpecies of inflammation, and yet the patient is ſo reduced, that you can ſcarce venture upon debilitating medicines, and where even the ſtricteſt diet does more general miſchief than local good.

Typhus, when combined with pneumonic ſymptoms, is a diſeaſe of the utmoſt danger. In the hoſpitals, among a number of patients, ſometimes ſcarce one ſhall recover. May not the pneumatic practice ſtand us in good ſtead here? that is to ſay, the cautious uſe of a lowered atmoſphere, while ſtimulants are freely given by the mouth?

XVI.—*Of the employment of oxygene air in diſeaſes.*

One principal argument for trying unreſpirable airs in conſumption, is the detriment frequently experienced from the uſe of oxygene. I have given an abſtract of 20 caſes, where Dr. Fourcroy has deſcribed it as ultimately prejudicial *(Obſervations, p.* 126, 127*)*. Dr. Scherer of Vienna, has ſince atteſted the ſame thing. I had every reaſon to confide in the accuracy of Fourcroy, and in one inſtance have ſeen a clear confirmation of his teſtimony. In Auguſt 1793, a patient, unconquerably diſguſted at hydrogene air, becauſe it produced ſome dizzineſs and nauſea on the firſt trial, entreated me to ſuffer him to inſpire a little oxygene. He obſerved, that as I believed this to be pernicious only from theory and the aſſertions of others, I ought to afford him what he conceived to be a chance of recovery. He breathed twice a day, for 5 minutes, a mixture of 1 part oxygene, to 3 parts atmoſpheric, air; at the moment he ſaid he felt lighter in his cheſt; but in 2 days, the cough became harder, the fever more violent, and all the ſymptoms were evidently aggravated. Believing that he had taken cold (as conſumptive perſons are ſo apt to perſuade themſelves when their diſorder becomes more ſevere), he tried an higher atmoſphere, after ſome interval, again. The effect was the ſame.

Another reaſon for removing oxygene from the air inſpired by ſuch patients, as much as poſſible, is its pernicious action upon moſt ulcers; and as it would ſeem on the ulcers of their lungs. Whether or not, in ſome caſes of conſumption, or of the indiſpoſition previous to conſumption, any exceſs of oxygene is received into the body, as I conjectured from certain appearances, I willingly leave to future obſervations to decide. If the hypotheſis be juſt, it ſuggeſts an additional argument for uſing a lowered atmoſphere.

There is, however, one ſtate of diſeaſed lungs, often followed by ſpontaneous ulceration, in which oxygene air promiſes to be uſeful. This ſtate is mentioned in ZOONOMIA, p. 300. It is attended with much expectoration of mucus, which the author, with much probability, imputes to want of irritability in the pulmonary abſorbents. This defect, eſpecially in pale perſons, who are threatened with that variety which has been called the *pituitous* conſumption, air of an higher ſtandard may cure. To prevent relapſes in hydrothorax, by rendering the abſorbents of the cellular ſubſtance of the lungs more irritable, oxygene ought to be employed.

Aſthma is a diſeaſe in which we might expect benefit from modified air. I am not now, however, ſo ſanguine in my expectations from an atmoſphere of an higher ſtandard, in all inſtances of this diſeaſe (the ſpaſmodic aſthma). In one caſe, on repeated trials under my own cautious management, ſuch an atmoſphere repeatedly induced ſtricture of the thorax, and at night ſeverer paroxyſms. The patient requeſted me to ſatisfy myſelf fully, before I relinquiſhed this mode of trial. He then deſired to inſpire a lowered atmoſphere, which certainly, upon a few trials, did not induce ſtricture or aggravate his complaint. But circumſtances ſeparated us before this method was fully tried. The following reaſoning of Dr. Darwin alſo induces me to hold up a lowered atmoſphere to the notice of thoſe who have aſthma to treat. "If "the excitability of the ſyſtem depends on the quantity "of oxygene abſorbed by the lungs in reſpiration, ſleep-"ing in an atmoſphere with leſs oxygene, might be of "great ſervice in epileptic caſes, and in cramp, and even "in fits of the aſthma, where their periods commence "from increaſe of excitability during ſleep."

In another caſe of aſthma, where an higher atmoſphere was uſed from my recommendation, but not under my inſpection, the patient aſſured me he felt great relief; and even when he was imprudent enough to breathe oxygene air undiluted, his aſthma was not rendered more ſevere; though, for a time, he was affected in a very curious manner: The ends of his fingers, in particular, ſwelled, and were very ruddy. After ſome uſe, his very imperfect apparatus failed: and the treatment was diſcontinued for want of air. I relate theſe perplexing appearances as difficulties to be ſolved by future obſervation. They may ſerve alſo as precautions.—In ſome diſeaſes, where the patient has been affected with languor and debility, oxygene air has appeared highly ſerviceable. It has been uſed in chloroſis with ſpeedy good effect. In coldneſs of the extremities of weak and old people, I have ſeen it remarkably efficacious. It raiſes the ſpirits, and, as far as I have been able to obſerve, without the ſubſequent or indirect debility occaſioned by opium or alcohol: A medical friend once obſerved, upon ſeeing a perſon who had been ſome time reſpiring diluted oxygene air, "his blood ſeems to flow in veſſels it never pervaded before." This had much the appearance of being the caſe. If ſo, ſuch an atmoſphere may retard the approach of old age, when many veſſels are ſuppoſed to cloſe up. In illuſtration of the effect of oxygene air on a perſon advanced in life, that is, between 50 and 60, with extremities habitually cold, I ſubjoin a note from Dr. Barrow, of the Hotwells, who lived in the ſame houſe with him. " —'s pulſe increaſed in frequency and " ſtrength; there were alſo other unequivocal ſigns of " general excitement; ſuch as univerſal ſenſation of " heat, and an aſtoniſhing increaſe of animal ſpirits, evi- " denced not only in his converſation, but his general " conduct. His ideas ſeemed to run altogether on ſub- " jects of juvenile gratification. His tricks and geſtures " afforded the company much entertainment. This " could not be aſcribed to any change in his diet; for he " had at this time diſcontinued his uſual quantity of wine " and the ſtimulating gums he had been accuſtomed to. " I am not ſure whether he had the head-ach, and other " ſymptoms of debility, ſubſequent to a debauch with " wine. Your's, &c.

" W. Barrow."

This perſon breathed a mixture of one part of oxygene, with 4 parts of atmoſpheric, air, twice a day, at firſt for 10, and then for 20 minutes.—I have had two patients who breathed an higher atmoſphere every day for more than 6 weeks each. The oxygene was procured from Mendip manganeſe. Theſe two inſtances, joined to my perſonal experience, ſeem to ſhew that there is no noxious impregnation in that mineral. The one was ſubject to great difficulty of breathing with exceſſive expectoration of mucus, from bad conformation of the thorax apparently. He was always much relieved by this modified air, but not radically cured. The other had encyſted dropſy with anaſarca of the lower extremities, and (as I ſuppoſed, from the difficulty of breathing, irregularity of the pulſe, and other ſymptoms) of the lungs alſo. By gradually heightening the ſtandard of the air, this patient reſpired unmixed oxygene air for half an hour without any inconvenience! So inert was the ſyſtem! The difficulty of breathing was effectually removed, but the other complaint was not relieved.

XVII.

XVII.—*Of atmoſpheres altogether artificial.*

If ever the power of elaſtic fluids on diſeaſed ſtates of the ſyſtem ſhould be inveſtigated on ſuch a ſcale as the intereſt of humanity enjoins, the trials will not be limited to the addition of oxygene or unreſpirable, to atmoſpheric, air. Change the unreſpirable conſtituent part of your atmoſphere, leaving the proportions the ſame, and you will probably have an atmoſphere with different powers. Take, for inſtance, 72 parts of hydrogene, hydrocarbonate or of carbonic acid air, and add 28 parts of oxygene. What you have to expect from the ſecond of theſe mixtures, the preceding experiments will ſufficiently warn you.

Whether hepatick air, or other modifications, can ever be employed with advantage in medicine, is a ſubject for future reſearch. Mr. Watt, having lately tried various ſubſtances capable of yielding air, has juſt given me the following information, which, though it was not ſent for publication, I take the liberty to add :—The manner is jocular, but the facts are curious :—" I have juſt made an air, which, as it has great powers, may, for ought I know, have great virtues ; my experience extends only to its bad qualities—*Pyro-ſarcate.* I put 2 oz. of lean beef in the fire tube, and obtained, by mere heat, 250 c. i. of air, highly fœtid, like an extinguiſhed tobacco pipe ; inflammable, with a very blue flame ; little diminiſhed by lime and water.—*Pyr-hydro-ſarcate*, on adding water to the red-hot charcoal of this beef, I obtained 600 c. i. of air, with a foetor not ſo bad as the other ; burning with an orange-coloured flame ; loſing not quite $\frac{1}{13}$ in lime and water. The ſmell of the firſt made me ſick, though I did not inſpire any purpoſely, and not above one third of the quantity mentioned was let looſe in my laboratory, and 3 doors and a chimney were open ; we were, however, obliged to leave the place for ſome time. The P. H. ſarcate ſeemed to poſſeſs the ſame property, but was more cautiouſly treated. G. was giddy all the afternoon. *Pyro-Comate.* Next day, 2 oz. of woollen rags were put in the tube ; they gave, by mere heat, 800 c. i. of air ; fœtid, though not ſo offenſive as the other ; burning with a deep blue flame ; not tried with lime and water.—*Pyr-hydro-comate*, by addition of water to the red hot charcoal, gave above 1½ cubic foot of air, fœtid, but more like vol. alkali in ſmell—burning with a yellow flame; loſing 1-5th by waſhing with lime and water; part was undoubtedly alkaline air and abſorbed by the water; the water in the refrigeratory was ſtrongly impregnated with fœtid vol. alkali. Though none of either of the airs was inſpired, that could be avoided, I had a ſlight, though uncommon, nauſea, attended with ſome elevation of ſpirits, all that evening, but no heat or thirſt. In ſhort, it was very like the effect of the fumes of tobacco on an unexperienced perſon: In bed I was reſtleſs, though without pain or particular uneaſineſs, I could not ſleep. Next day the nauſea, and ſome giddineſs, continued, or rather increaſed, and a head-ache came on.—The uſes of this air, if it has any, I leave you to find out. I think I ſhall have no more to do with it, or with animal ſubſtances: One may diſcover, by accident, the air which cauſes typhus, or ſome worſe diſorder, and ſuffer for it. J. W."

OCT. 7, 1794.

PROGRESS of knowledge renders ſtability of language impoſſible. Hence, in treating of a new ſcience, licence of expreſſion is allowed. Whether I have abuſed this privilege by diſoxygenated *and other terms of " learned length," perſons, ſkilled alike in the philoſophy of things and words, may decide. Claſſical Scholars are commonly regarded as the beſt judges of Engliſh ſtyle; but there are circumſtances which would appear to derogate from the competency of mere Claſſical Scholars.* 1. *Progreſs in the languages of Xenophon and Tully being for ever cloſed, thoſe who have ſtudied little beſides, follow the analogy of their education, and are apt, when they regard Science, to look only backwards.* 2. *Without great precaution, their minds become frivolous, and their criticiſms will, in conſequence,*

ſequence, be captious. 3. *Perſons, the moſt eminently ſkilful in Greek and Latin, now appear to little advantage in this department of Literature.* HERMES *aſſigns cauſes for effects that do not exiſt; hence his conceits appear like a burleſque on the philoſophy of language. Several precepts and ſtrictures, in the moſt popular Introduction to Engliſh Grammar, ſeem to me miſchievous. The Author, upon the authority of his taſte alone, or upon falſe analogies, has, if I am not miſtaken, in numerous inſtances unjuſtly condemned our fineſt writers as violators of the rules of his art. Such errors tend to diminiſh the copiouſneſs of our language, and to impair the moſt rational of amuſements.*

PART II.

PART II.

DESCRIPTION
OF AN
AIR APPARATUS;
WITH
HINTS RESPECTING THE USE AND PROPERTIES OF DIFFERENT ELASTIC FLUIDS.

BY JAMES WATT, ESQ.

Heathfield, *Birmingham*, *July* 14, 1794.

DEAR SIR,

I SEND you with this, drawings of my apparatus for producing and receiving the various airs which may be ſuppoſed to be uſeful in Medicine, with a deſcription or explanation of the apparatus, which, if you ſhall think it worthy publication, I hope may at leaſt prompt ſome younger and more active man to contrive a better.

In conſequence of your deſire, Boulton and Watt have agreed to manufacture theſe machines for the Public. You wiſh that a price could be fixed, but that cannot be done at preſent, until ſome more are made, and our workmen underſtand it. At preſent, they are but bunglers in executing ſome of the parts, and improvements may ſtill be made, which may encreaſe or diminiſh the price.

However, we have no deſire to be the manufacturers, except to ſupply thoſe who may not have the ſame opportunities as ourſelves of procuring them; the price ſhall be as moderate as we can make it; and thoſe who chooſe to have them made by others, ſee what is to be done.

In a former letter, I mentioned my ideas upon the airs which I apprehended might be uſeful in conſumptions, and ſome other diſorders of the lungs; but as I then obſerved, it is not my province to preſcribe; that muſt be left to the phyſician. It may be right, however, to ſay, that, according to the experience of ſeveral perſons here, the inflammable air from charcoal, on being inhaled into the lungs, renders the perſon who breathes exceſſively giddy and ſick, in a very ſhort time; from whence I conclude, that ſome new compoſition or abſorption takes place in the lungs; probably the charcoal which it contains in ſolution is abſorbed by the blood; and if ſo, it may prove an antidote to the oxygene the blood is ſuppoſed to contain, in too large quantities, in conſumptive patients. I ſhould think, that on account of its great activity, this air ought to be given in a very diluted ſtate, otherwiſe it might prove too much for the patients.

The inflammable air from zinc contains the calx or flowers of that metal, in a ſtate of ſuſpenſion, if not of ſolution, and may alſo be uſeful in curing ulcers in the lungs, as a topical application. This air does not render the patient ſick; but in an experiment I made on myſelf, it ſeemed very much to thicken the mucous matter ſpit up in the morning after.

Again wiſhing you to be ſucceſsful in this undertaking, which promiſes to be of ſo much utility to mankind, I remain, with much eſteem,

DEAR SIR,

Your obedient humble ſervant,

James Watt.

To Dr. BEDDOES.

P. S. If any ſets of apparatus are wanted, pleaſe addreſs to Boulton and Watt, Birmingham.

DESCRIPTION

DESCRIPTION *of an* APPARATUS *for procuring various kinds of* AIR, *for* MEDICINAL *purpoſes.*

THE apparatus conſiſts of an alembic, or pot (A) and its capital (B). The latter is connected by a pipe (F) with the refrigeratory or waſhing veſſel (G), which again communicates by a pipe with the Hydraulic Bellows (H. J.) which receives the air as it is generated or produced, and transfers it into oiled ſilk bags, or other veſſels, from which it may be conveniently inhaled by the patient.

The pot (A) is made of ſoft caſt iron, of the form in the drawing, and is about ſix inches diameter in its wideſt part or *bilge*; the thickneſs of the metal about half an inch. The lower part of the capital (B) is made conical, and ground into the mouth of the pot, ſo that it may be made tight with a ſmall quantity of cement. An iron tube, half an inch inſide diameter, paſſes perpendicularly through the centre of the capital, and reaches within half an inch of the bottom of the pot. This tube is continued four or five inches above the capital, where it ends with a conical mouth at (C). It is fitted into the capital by a conical ſwelling, which is ground into a correſpondent hole, and made tight with cement. Another tube (D C), made conical at its lower end, is fitted into the conical mouth (C) of the lower tube. The lower end of the tube (D C) is contracted ſo as to form a hole of about 1-20th inch diameter, which is capable of being ſtopt or ſhut by the end of the wire (E), which is fitted to it. This tube is one foot long, and has a cup or baſon at its upper end. The wire (E) is formed into a fine threaded ſcrew at the upper end, and is ſcrewed through a bridge in the cup, ſo that by turning the wire, it may open or ſhut the hole at the bottom of the tube, as occaſion requires. The proper taper, for theſe ſeveral cones, is about one in eight (that is, for every inch they are long, they ſhould be 1-8th of an inch leſs in diameter at the ſmaller than at the larger end).

The tube (F), which conveys the air from the pot to the refrigeratory, is about 1-$\frac{1}{4}$th inch diameter, and taper for about three inches at both ends, which enter into the pipe ſide of the capital and the receiving pipe (N) of the refrigeratory. This tube is made of ſheet iron brazed with hard ſolder. The length of this tube is from three feet to ſix feet, as ſuits the convenience of the operator.

The refrigeratory (G, S S, Pl. 2. Fig. 2 and 3) conſiſts of two veſſels, of which one is placed in an inverted poſition, within the other. The outer veſſel is cylindrical, about twelve inches diameter, ſeven inches deep, and open at top. On one ſide there is a funnel (R. ſee Pl. 2. Fig. 2.) and a ſemicircular pipe attached to the outſide of the veſſel, paſſing through the ſide of it near the bottom, and continued inwards along the bottom for about 1$\frac{1}{2}$ inch. On the oppoſite ſide of the veſſel are two ſhort pipes, about an inch diameter each, the upper one for letting off hot water, and the lower one for emptying the veſſel when required.

The inner veſſel of the refrigeratory (S S Pl. 2. Fig. 3.) is alſo cylindrical (of ſuch diameter as to enter eaſily into the outer veſſel), and is open at bottom. The cover of it is convex upwards, about an inch. Upon the underſide of this cover is formed a ſpiral channel, by means of metalline plates, about 1$\frac{1}{2}$ inch deep, and one inch aſunder. This ſpiral channel is open below, but the edge of the ſlip of metal which forms it is well ſoldered to the concave ſide of the cover. The receiving pipe enters this channel cloſe to the circumference of the veſſel S S, and the diſcharging pipe O P is fixed upon the central end of the ſpiral. Cloſe to the pipe O, is another ſhort pipe, which paſſes through the cover of S S, and reaches downwards about an inch and a half, being open at both ends. In the edge of the veſſel S S is a notch (T), which, when that veſſel is placed within the veſſel G, receives the lower end of the pipe R, and permits the rim of the veſſel S S to reſt upon the bottom of G; in which poſition it is to be retained, by laying weights upon it.

The diſcharging pipe conveys the air to the Hydraulic Bellows (H J), which conſiſts of two veſſels (H and J, Pl. 2. Fig. 1.) The outer veſſel H conſiſts of two cylinders, placed one within the other, and about half an inch aſunder. Theſe cylinders are joined together at bottom by a circular rim, well ſoldered to them both; and the inner cylinder is ſhut at top by a cover alſo ſoldered on. This inner cylinder is about two inches ſhorter than the outer cylinder, and the latter is ſurmounted by a cup (W W) about $1\frac{1}{2}$ inch deep, and one inch all round, more diameter than the cylinder it is attached to. The pipe P Q paſſes diametrically acroſs the veſſel H; the end Q is open, and made ſo as to be ſtopt with a cork or cock. From this pipe P Q proceeds a pipe (V), which paſſes upwards through the cover of the inner cylinder, to which it is ſoldered, and is open at its upper end. The ſecond veſſel J of the bellows is a hollow cylinder of one foot diameter, and eighteen inches long, ſhut at top, and open at bottom; it is made ſo as to move up and down eaſily in the circular interſlice between the inner and outer cylinder of the veſſel H; and when that interſlice is filled with water, as high as the cover of the inner cylinder, if the veſſel I is moved up and down, it will act the part of a bellows, drawing in and blowing out air, by the pipes V and P Q. The bellows and refrigeratory are made of tinned iron plates japanned, or of tinned copper-plates not japanned.

Fig. 4, Pl. 2, is a ſection of the pot, its capital, and the pipe which paſſes through the latter.

Fig. 5 is a ſection, of the natural ſize, of the upper and lower ends of the wire E, and of the lower end of the pipe D C, which admits water into the pot.

Fig. 2, Pl. 1, is a plan of a large chafing diſh or furnace, in which the pot may be placed. This furnace, and its aſh-hole, may be made of black ſheet iron, and the furnace lined with fire lute or Windſor bricks. The cover is made in three moveable ſegments of a cone fitted to the mouth of the furnace, and to the neck of the pot, but leaving an opening on the ſide oppoſite to the pipe F, for the iſſue of the ſmoke and flame. Theſe ſegments ſhould alſo be lined with fire lute.

Fig. 3d is a ſection of an iron tube, which may be uſed in place of the pot, if found preferable.

MANNER OF USING THE APPARATUS.

The pot is to be filled with a ſufficient quantity of the material, by means of which, or from which, the deſired air is to be procured. The lower end of the capital is to be anointed with a ſmall quantity of the proper cement, put into the mouth of the pot, and turned round a little, preſſing it down at the ſame time, until the joint is concluded to be made good. The pot is then to be placed in the furnace upon its pedeſtal (of iron or brick), and a fire of good coaks is to be made round it. The covers of the furnace being put on, the pipe C is to be anointed with cement on its lower cone, and twiſted forcibly into its place in the capital. The joints of the pipe F are to be cemented at both ends, and the two veſſels of the refrigeratory being previouſly put one within the other, the two ſhort pipes in the ſide are to be ſhut with corks or cocks, and the veſſel G is to be nearly filled with cold water; the joint of the pipe P, with the bellows, is to be cemented, and the outer veſſel H of the bellows filled with water to the height indicated (the veſſel J being placed within it, and preſſed down to the bottom), and the pipes O and Q are to be ſhut with corks.

In the proceſs for producing inflammable air from charcoal, iron, or zinc, when the pot is become quite red hot, as high as the neck, the wire E being ſcrewed down ſo as to ſtop the opening, the pipe D C is to be put in its place, and the baſon D filled with water, then, upon unſcrewing the wire E about a turn, ſome of the water will drop into the pot, and the inflammable air will immediately be produced, and will proceed by the pipe F to the refrigeratory, where it will diſplace ſome of the water, and glide along the ſpiral channel to the centre, depoſiting its heat, or other matters capable of uniting with water, as it paſſes in contact with it. It will then paſs quite cool by the pipe O P into the bellows. The weight L (which is made juſt to counterbalance in air the weight of the veſſel J) will, by means of the cord attached to J and paſſing over the pullies K K, pull up the veſſel J in proportion as the air enters.—When the veſſel J is drawn up till its cover touches the frame M M, the cork Q is to be taken out, and the wooden nozzle of an oiled ſilk bag, hereafter deſcribed, is to be forced into the hole, ſo as to be air tight. The veſſel J being then preſſed down by hand, the air will paſs into the ſilk bag; when the bellows is emptied, preſs your thumb on the outſide of the ſilk againſt the outer orifice of the wooden nozzle, withdraw the nozzle from the pipe Q, and replace the cork, that the operation may go on as before.

The air in the bag may then have a proper proportion of atmoſpheric air added to it; and when thoroughly mixed, can be inhaled with great eaſe from the nozzle of the bag, eſpecially if the latter is laid on its ſide on a table.—When the water in the refrigeratory becomes hot, the cork of the upper ſhort pipe in its ſide is to be taken out, and cold water poured down the funnel R, which, being ſpecifically heavier than the hot water, will diſplace it, and the latter will iſſue upwards through the ſhort pipe near the centre, and paſs off by the pipe at the circumference. When the water ſeems ſufficiently cooled, the cork is to be replaced, and the operation will proceed as before: indeed it need not be ſtopt while the water is thus changed.

In producing air by means of charcoal, the charcoal ſhould be previouſly burned till it yields no ſmoke; and care ſhould be taken that nothing capable of doing ſo enter the pot. There ſhould be as much charcoal put in as will fill the pot up to the neck or cylindric part; it ſhould not be pounded, but broken into little bits, about the ſize of a hazle nut; but what is inevitably made ſmaller in the breaking, need not be rejected; it will be proper to force an iron down through the charcoal, to open a way for the pipe, before the latter is put in.

When the air is wanted to be made by means of iron, the beſt is the turnings of *hammered* iron, to be had from the jobbing ſmiths. Caſt iron turnings or borings always give ſome very ſtinking hepatick air.

If the air is to be obtained by means of zinc, the metal ſhould be granulated, by pouring it, while melted, in a ſmall ſtream into water; and the water pipe of the capital ſhould either be cut ſhorter, or ſome ſmall holes drilled in its ſide, as the water could not eaſily force its way through a pillar of the melted metal; only a few pounds of this metal ſhould be put in at a time, as only

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the ſurface can be acted upon; and that is ſoon covered with the melted calx. As zinc has a great affinity with iron, and the heat required in this caſe is conſiderable, it will be proper to coat the inſide of the pot with a thin covering of China clay, or ſome other apyrous earth, mixed up with a ſolution of borax, to prevent the contact of the metals.

In obtaining dephlogiſticated or oxygene air from mangancſe by heat, no water muſt be added, and the hole for the water pipe ſhould be ſtopt by an iron plug fitted to it. But probably an iron veſſel, made in the form of a Florence flaſk, may be a more commodious veſſel for this purpoſe, which remains to be tried. In any caſe, the refrigeratory and bellows remain the ſame. I can give no *particular* directions in the proceſs for obtaining dephlogiſticated air, in this way, having never practiſed it.

It appears probable that the fire tube, Fig. 3, Pl. 1, may be found a more commodious or effective veſſel than the pot, but I cannot yet determine that point, not having hitherto had time to get it tried. Both Mr. Lavoiſier and Dr. Prieſtley uſed tubes. I have added the new water pipe, which admits the water by means of a conical wire, inſtead of a cock, uſed by the former, or of the retort uſed by the latter, and have made the operation of ſhutting the ends eaſier.

The pot of the ſize indicated will produce about a cubic foot of inflammable air from charcoal in five minutes, with a good fire.

The quantity of water to be admitted into the pot muſt be regulated by experience, if the pipe at N becomes very hot, and a loud cracking noiſe is heard in the refrigeratory, too much water is thrown in, and ſteam reaches the refrigeratory. When air only iſſues from the pot, the pipe at M will not be much heated.

The joints at N and P may be cemented with a dough, made of the Corniſh china clay with ſome flour and water, or with the common chemical lute, compoſed of whiting, ſalt, flour, and water. The joints of the capital with the pot, and with the pipes F and C, muſt be made good, by a cement of the Corniſh china clay, moiſtened with a ſaturated ſolution of borax, or by a mixture of fine ſlaked lime and ſolution of borax, which latter will, I apprehend, be improved by the addition of colcothar of vitriol. Care muſt be taken not to ſhake the veſſels, after the joints are made, leſt the cement ſhould crack, and let out the air.

The oiled ſilk bags ſhould be made in the form of a common ſack, and have a wooden nozzle fitted to them in the ſhape of a common faucet, with the ſmaller end outwards, that it may fit into the tube of the bellows; and this faucet ſhould be provided with a ſpiggot to keep in the air when required. Oiled ſilk has commonly a very diſagreeable ſmell, which, as it is not certain that it would be of ſervice in any of the diſeaſes that may be treated by theſe airs, it is deſirable to get rid of; this I have accompliſhed by the following proceſs:

Take charcoal, freſh burnt till it is free from ſmoke, reduce it to powder, and ſift it: Lay the ſilk on a table, and ſift this charcoal over it, to the thickneſs of a quarter of an inch; then roll the ſilk, charcoal duſt, and all, upon a roller, as long as the ſilk is wide, and not leſs than an inch and a half in diameter; bury the whole in charcoal duſt, and let it lie two or three days; unroll it, and ſweep off the charcoal; and if the ſmell is not quite gone, repeat the operation with freſh charcoal duſt; when free from ſmell, waſh it clean with a wet ſponge. When the ſilk is made into a bag, anoint the ſeams with japanners' gold ſize, diluted with ſome oil of turpentine, which will dry ſufficiently in a few days.

In chuſing oiled ſilk for this purpoſe, that which is green ſhould be avoided, as it is coloured with verdegris, which adds to the bad ſmell, and rots the ſilk. The yellow, or yellowiſh, is the beſt.

As patients, when very weak, cannot be made to breath out of a bag or other veſſel through a mouthpiece, I think the inflammable air may be adminiſtered by placing upon their head a cap in the form of a beehive, about a foot diameter at the baſe, reaching as far down as their chin. If the pipe of the bag, containing the air, is placed near their mouth, and the bag gently preſſed, as inflammable air is lighter than atmoſpheric, the cap will be filled with it, and they muſt infallibly breath it, and at the ſame time will be under no teazing conſtraint.

SUPPLEMENT TO THE DESCRIPTION AND USE OF THE APPARATUS.

EXPERIENCE has ſhewn, that for private practice, an apparatus on a ſmaller ſcale than that deſcribed will be ſufficient; and one is now conſtructing of only a quarter of the contents, the bellows of which will be about nine inches diameter, and thirteen inches high, and the other parts proportionable. The furnace, twelve inches outſide diameter, will have a fire tube two inches inſide diameter, and ſixteen inches long, nine inches of which being expoſed to the fire, will, it is expected, produce air in ſufficient quantities.

As it appears from experiments made by Doctor Beddoes, that oxygene air is produced moſt eaſily, and in the greateſt purity, from Exeter manganeſe and oil of vitriol, by diſtillation in a glaſs retort, a ſand pot is fitted to the mouth of the furnace, a ſhort bent chimney pipe is adapted to one of the holes made for the fire tube, and a fire door at which coaks may be put in, is fitted to the other, ſo that the furnace may be uſed for that or any other chemical diſtillation; and to regulate the fire, an air hole, with a ſliding damper plate, is made in the ſide of the aſhpit.

On all occaſions, when this or the larger furnace is uſed, it will be proper to ſhut the door of the aſhpit, and to admit the neceſſary air by the air hole, otherwiſe, when the coaks are good, the fire may become too hot, and injure the pot or fire tube; the proper heat for which is a moderate red heat, or the loweſt heat, at which experience ſhows that the deſired air is produced.

For infirmaries, apothecaries or others, who wiſh to make large quantities of air, the larger apparatus may be uſeful; but as from fifty to one hundred cubic inches of the heavy inflammable air, or hydrocarbonate, mixed with the proper quantity of common air, is a ſufficient doſe, or perhaps three or four times that quantity of the pure inflammable, or hydrogene air, if the apparatus can make three or four cubic feet in an hour, it would ſeem large enough. Where fixed air is wanted to be made from chalk or marble, by means of water and heat, or from manganeſe by mere heat, the larger apparatus may be neceſſary, as the ſmaller would not contain enough of the materials.

The fire tubes, upon trial, ſeem to anſwer perfectly well, and in many caſes are preferable to the pots, tho' in other caſes, the latter are more convenient. The ſmaller apparatus will not admit of the uſe of a pot; but thoſe who need a large apparatus, may have the furnace adapted for both, as well as for a ſand heat.

The pot anſwers very well for diſtilling empyreumatic oils, or other ſubſtances of that nature; but in this caſe, a common glaſs receiver ſhould be adapted to the conducting tube in place of the refrigeratory.

As it is troubleſome to empty the hydraulic bellows of the artificial air every time we want to meaſure common air into the oiled ſilk bags, it will be found convenient to have an additional bellows for that uſe, and the ſmaller ſize will be in general ſufficient. When you have introduced into the bag the quantity of artificial air you intend, fill the ſpare bellows with common air, apply the faucet of the bag to one of the pipes, and ſhut the other with the hand, or otherwiſe; then diſcharge the contents of the bellows into the bag, ſtop the faucet, by applying your finger on the outſide of the bag, to its orifice; then admit air into the bellows, by opening the other pipe, and proceed as before, until you have put in the deſired quantity.

This operation may be facilitated, by fixing a cock into the pipe, by which the bellows receives the common air.

As every patient may not have conveniencies for fixing an apparatus, and the bags cannot be depended upon for containing the air for any length of time, it is deſirable to have ſome means of ſending theſe artificial airs to a diſtance, or for ſtoring them up to avoid the neceſſity of heating the furnace on every occaſion. The following has occurred as a means of anſwering both theſe ends. Let a cylindrical veſſel be made of ſtrong tin plate (as in Fig. 1, of Pl. 3.) this veſſel is to be cloſe at both ends, which are made concave outwards, cloſe to both the bottom and cover, ſhort pipes U and V proceed from the ſide of the veſſel, their diameters ſhould be the ſame as the pipe P Q of the bellows.---Another pipe (T) paſſes through the middle of the cover or upper end of the veſſel, to which it is well ſoldered, and reaches within half an inch of the bottom. To guard this veſſel from ruſt, it ſhould be japanned both inſide and out; and for the greater convenience of japanning it within, it may be made to come aſunder at the middle of its height; and when varniſhed, may be cemented together, by a mixture of wax and roſin uſed hot.

When this veſſel is completed, the upper pipe (U) is to have a ſhort pipe (W) inſerted into it, which ſhould alſo fit the pipe Q of the bellows. The lower pipe (V) is then to be corked, and the veſſel filled with water, by the central pipe (T). This veſſel, which may be denominated an *air-holder*, is to be placed in an empty tub, the pipe W inſerted into the pipe Q of the bellows, and cemented to it.

When the bellows are filled with artificial air, the cork of the lower pipe (V) is to be taken out, and the counterpoiſe of the bellows is to be lifted up; the water in the *air holder* will then run out into the tub, and the air deſcend from the bellows into the former veſſel. The air holder, thus filled with the artificial air, and all its pipes cloſely corked, muſt be kept in a cool place till wanted. To transfer the air from this veſſel into a bag, fix the faucet or mouth-piece of the bag into the upper pipe (U), and if you want a quart, or gallon, or other meaſure of air, pour ſo much water into the air holder through the central pipe, and exactly that quantity of air will iſſue out into the bag; then re-cork your veſſel, until you want more air from it. When the air holder is larger than the bellows, it will be proper to have a cork fixed in the lower pipe (U), at which the water may be ſuffered to iſſue no faſter than air is produced by the apparatus, otherwiſe the pillar of water in the air holder will draw in common air, through the openings of the refrigeratory.

If ſeveral of theſe veſſels are provided, a ſtock of air may be laid up for as many days as experience ſhall ſhew that the air will keep good, and doſes may be eaſily ſent to diſtant patients. The ſize of the veſſel muſt be regulated by convenience, but may anſwer very well if the veſſel is made a cylinder of twelve inches diameter, and ſixteen inches high, which is about equal to the contents of the bellows of the larger apparatus.

Fig. 2, Pl. 3. ſhews the form of a chafing diſh for collecting a mixture of azotic and fixed airs from burning charcoal, and a refrigeratory for cooling it, as it paſſes to the bellows.

The chafing diſh (A) is to be filled *quite full* with burning charcoal. The trough of the refrigeratory (B) is to be filled with water, and the end (C) of the pipe is to be joined to the pipe (P) of the bellows; when the charcoal has ceaſed to ſmoke, the bellows are to be raiſed very ſlowly; the air which has ſerved to animate the fire will paſs into it; and when the proceſs is judiciouſly performed, will be found to contain no uncombined dephlogiſticated air.

Fig. 3. Pl. 3. is a ſection of a circular refrigeratory for the ſame purpoſe, the upper part of the veſſel is to be kept ſupplied with cold water, which will deprive the air of its heat as it paſſes through the veſſel, but no water is to be put into the ſpace below the diaphragm. The air is admitted by the pipe (a), and iſſues by the pipe (b) to the bellows.

When fixed air is to be produced from red hot chalk or marble, by means of water, this latter refrigeratory ſhould be uſed, as the circulating refrigeratory deſcribed in Pl. 1 and 2, by bringing the air in contact with the water, much of it would be abſorbed, and would never reach the bellows. The ſpace below the diaphragm ſerves to collect the water proceeding from the condenſed ſteam, ſome of which will always come in with the air.

Fig. 4, Pl. 3, is a ſection of the furnace for the ſmaller apparatus, furniſhed with a ſand pot, to be uſed as a diſtilling furnace. When it is uſed with the fire tube for producing inflammable air, &c. the chimney pipe (a) and pot (b) are taken off, and the tube is introduced through the openings left for the fire door and chimney; and as the fire tube is made a little ſmaller at the ends than in the middle, the vacuities round it in the holes of the ſides of the furnace are filled up by two rings of caſt iron, fitted to them, and to the ends of the fire tube; and in this caſe, when a fire is made, the furnace is to be filled up to the mouth with coaks.

The outſide diameter of this furnace is twelve inches, and the inſide diameter within the brick lining is nine inches; the height from the grate to the top is nine inches; and the depth of the aſh pit below the grate is ſeven inches. Windſor bricks, rubbed to the form, make a very good lining.

In producing theſe airs, if the quantity of water admitted through the water pipe is no more than can enter into the compoſition of the air, the latter ſeems to be more exalted in its properties than when more water is admitted; and it alſo ſeems to carry with it, in a ſuſpended ſtate, more of a powdery matter, which appears to be part of the ſolid ſubſtance from which the air was prepared; this powder is depoſited when the air ſtands ſome time quieſcent; and therefore it would ſeem that there ſhould be a difference between the medicinal virtues of the air, when freſh made, and thoſe it poſſeſſes after ſtanding ſome time, which requires the attention and obſervation of practitioners to regulate the doſes in its ſeveral ſtates, to determine in which of them it ſhould be ſerved; or whether it ſhould be uſed at all before it has ſubſided.

The proceſs for making the inflammable airs ſhould not be carried on by candle light, if it can be avoided; as the ſtream of air, when diſcharged from the bellows, would catch fire by the approach of the candle, and produce dangerous exploſions.

The firſt produce of the air, in any of the operations, ſhould be rejected, as its purity will be uncertain.

The uſers of the apparatus will do well to ſtudy the means of judging of the purity of the airs they employ; for which purpoſe, an attentive peruſal of Doctor Prieſtley's Treatiſes on Air is recommended.

Birmingham, June 17, 1794.

DEAR SIR,

HAVING never made the art of medicine my particular ſtudy, I ſhould not have troubled you with my crude ideas upon the uſe of pneumatic medicines, if your approbation of what I mentioned to you, joined to my earneſt deſire to aid your endeavours, with the hope that poſſibly ſome idea might be ſtarted, which may ſave other parents from the ſorrow that has unfortunately fallen to my lot, had not urged me to ſtep over the bounds of my profeſſion.

It appears to me, that if it be allowed that poiſons can be carried into the ſyſtem by the lungs, remedies may be thrown in by the ſame channel. Remedies for ſome fatal or dangerous diſorders may, poſſibly at leaſt, be found in the claſs of airs which admit of many known modifications, and doubtleſs many more ſtill to be diſcovered :—which of theſe may prove beneficial in conſumption, and other analogous diſorders of the lungs, remains to be aſcertained by experiment. You have ſhewn that oxygene air is hurtful in many of theſe diſorders, though beneficial in ſome caſes of aſthma ; its oppoſites inflammable, azotic, and fixed air, ſeem then to be thoſe which are moſt likely to be uſeful in phthiſis : But there are alſo ſubſtances which ſome eminent phyſicians have thought might be uſefully employed even in the ſtate of powder, ſuch as Peruvian bark, the calces of lead and zinc, with other aſtringents.

To the uſe of powders, however finely *mechanically* divided, I think there are ſome objections ; particularly I doubt whether they could enter the minute veſicles of the lungs ; but if ſuch ſubſtances can be *chemically* divided and obtained in the ſtate of ſolution in air of ſome congenial ſpecies, they might have their full effect.

It is well known, that inflammable air, when produced by the common proceſs from iron and vitriolic acid, always carries with it, even through water, a large quantity of iron ; ſome of which it afterwards depoſits, but very probably ſome part ſtill remains ſuſpended. If iron ſhould then be eſteemed a proper medicine for diſorders of the lungs, we are thus furniſhed with the means of obtaining it in a ſufficiently divided ſtate; and to free it from any adherent acid, it may be paſſed through a cauſtic alcali.

If the calx of zinc is thought preferable, it is ſuſpended in inflammable air in great quantities, by applying water or ſteam to red hot zinc in cloſe veſſels, and probably alſo by the common proceſs of making common inflammable air from zinc by vitriolic acid. The calces of zinc are very efficacious in healing external ſores; and are very likely to be ſo in internal ones, provided they can be applied, as I think they may, by the means indicated.

Charcoal has lately been found extremely efficacious in correcting putridity, and in diſpoſing ulcers to heal. It ſeems to me, that no ſubſtance is diſſolved in common inflammable air in ſuch quantities as charcoal, nor more intimately united. If water is applied to red-hot charcoal in cloſe veſſels, the heavy inflammable air is produced in large quantities; and this air has been found to contain inflammable air, properly ſo called, fixed air, ſeparable by water or by alkalies, and ſome other ſubſtance, which, when the inflammable air is deflagrated with oxygene air, produces fixed air. This ſubſtance I conſider as charcoal in a ſtate of ſolution; for were it fixed air completely formed, it would be ſeparated by the means mentioned. Whether charcoal in this ſtate could be decompoſed by any exceſs of oxygene in the blood of conſumptive patients, I cannot ſay; but it ſeems likely that it would; and at any rate it would act as charcoal powder does, and therefore highly merits trial.

As fixed air is a ſaturated ſolution of charcoal in oxygene air, it is not probable that the lungs can decompoſe it; we ſhould therefore only look to its effects as an antiſeptic. As the lungs, when doing their duty, ſhould ſeparate, and throw out fixed air, it is not probable they will abſorb it, though it may have ſome effect merely by excluding the oxygene of the common air. I think, however, it will be found to have moſt beneficial effects in caſes of a putreſcent tendency; or if you do not like this theoretical phraſe, where the breath and expectorated matter are fetid. The ſpecies I would recommend is that from fermentation and the means, keeping a veſſel of fermenting wort cloſe by the patient, which will in general be ſound grateful to him.* Fixed air, from vitriolic acid and calcareous earths, may be occaſionally much contaminated by other acids. The oil of vitriol of commerce is generally impure, containing ſulphureous acid, with the nitrous and marine; it ſhould be rectified for the purpoſe of medicine.

Inflammable air is ſaid to act as a ſolvent of dead animal ſubſtances; it may therefore act favourably upon the viſcid mucus, ſometimes ſo troubleſome in conſumption.

I can conceive no action of the azotic air, except the negative one, of excluding the oxygene.

If aleppo galls are ſubjected to a heat a little greater than that of boiling water, they throw out much fixed air united with their own peculiar acid, and a very aſtringent taſte and ſmell. The acid may be moſtly ſeparated, by paſſing the air through water. You can judge better than I, whether this aſtringent air might not be uſeful in ſome caſes.

The hepatick inflammable air may have good effects in other caſes; but its ſmell is very diſagreeable to the patients; it may be obtained from alkaline or calcarious hepars, or from ſulphurated metals, by means of vitriolic acid.

The inflammable air of marſhes is ſuppoſed to cauſe fever, which is ſaid to be a diſeaſe of an oppoſite nature to pthiſis, at leaſt to ſuſpend it. If I remember right, this air is ſimilar to that obtained from red-hot charcoal by water, but with the addition of hepatick air.

If it be certain that butchers are exempt from phthiſis, putrid animal effluvia may be uſeful; and if the matter which conſtitutes the ſmell be not the uſeful part, it may be corrected by powder of charcoal, which does not otherwiſe hinder the progreſs of putrefaction. The ſmell ſeems to be owing to ammoniacal hepatic air.

The mixture of azotic and fixed air to be obtained from burning charcoal (firſt freed from bitumen by heat) might be tried, but I ſhould hope more from the heavy inflammable air of charcoal.

---

* I know that Mr. W. ſpeaks here from attentive obſervation ——T. B

This latter ſpecies is recorded by Dr. Prieſtley to have been produced moſt rapidly, from a mixture of ſcales of iron and charcoal, ſubjected to a ſtrong heat in an earthen retort, and in this caſe would probably contain much iron.

The oxygene air may alſo be impregnated with various ſubſtances. When it is made by paſſing the ſteams of ſp: nitri through a red hot tobacco pipe, it is highly charged with a white powder, ſome part of which it lays down on the contact of water; when produced in glaſs veſſels, I have never ſeen it contain any ſuch white matter. An eminent phyſician, of your acquaintance, previous to my mentioning to him the ideas I now ſend you, obſerved to me, that the oxygene air from heated manganeſe, had a peculiar taſte and ſmell; and that unleſs ſome other facts led to aſcertain the ſubject, he ſhould be at a loſs to determine whether ſome of the cures you mention *might* not be attributed as much to the manganeſe as to the oxygene. He alſo, a priori, had entertained ideas of the good effects of ſubſtances diſſolved in airs.

Upon my preſent degree of knowledge, were I to try to diſſolve metallic or earthy ſubſtances in oxygene air, I would place the impregnating earth or calx in a well coated glaſs tube, heated red hot, and paſs the ſteam of ſpirit of nitre through it, afterwards waſhing the air with an alkali.

You will now, my dear Sir, think that I have gone far enough with mere hints, ſupported only by analogy, and may perhaps have perceived, that however incompetent, I have ventured to differ a little from you. I am for conjoining the operation of ſubſtances likely in themſelves to prove ſanative, to the privation of oxygene, which, however, I do not diſpute may of itſelf produce good effects.

In regard to the manner of breathing theſe medicinal airs, I think it will be done beſt from bags of ſome very flexible and light ſubſtance, ſuch as very thin leather waxed, or oiled ſilk. If a ſmall tube be inſerted into the mouth of the bag, the air may be preſſed out oppoſite the patient's mouth, in caſes when they are too weak to make extraordinary exertions of the lungs, or rooms may be filled with the proper mixture of airs.

It would be deſirable that a liſt were made out of all ſubſtances, which are known to be ſoluble in air of any kind, or are of themſelves reducible to vapour or ſteam, that experiments may be made upon their ſanative effects in caſes of diſeaſed lungs. The liſt will prove more numerous than may appear at firſt glance.

Having now explained my general ideas, I ſubmit them to your correction,

And remain, with much eſteem,
Your's,

James Watt.

TO DR. BEDDOES.

Birmingham, Sept. 2, 1794.

DEAR SIR,

YOU deſire me to ſend you a more particular account of my obſervations on the medicinal airs than was contained in my former correſpondence on that ſubject. In my letter of June 17th, I mentioned that it ſeemed to me that the heavy inflammable air, or carbonated hydrogene, being principally a ſolution of charcoal in inflammable air, was more likely than any other to correct any diſeaſe ariſing from ſuper-oxygenation of the blood. I could not, however, foreſee that its effects would be ſo powerful in ſome reſpects as they have proved. In the beginning of July, I made ſome of this air by the application of water to red hot charcoal in a cloſe veſſel. Its ſmell was ſomewhat hepatick, from the new caſt iron veſſel it was made in, and was alſo contaminated, by a bad lintſeed oil varniſh in the refrigeratory, its taſte was that of fixed air, though more feeble. I inhaled a little of it cautiouſly, but had ſcarcely withdrawn the pipe from my mouth before I became ſo giddy, that I could not ſtand without a ſupport. I had alſo conſiderable nauſea. A healthy young man, who ſtood about 6 feet from the hydraulic bellows when I diſcharged about a cubic foot of this air, was affected in the ſame manner, as it paſſed by him towards an open door. Another young perſon, merely from ſmelling to it as it iſſued from the bellows, fell upon the floor inſenſible, and wondered where he was when he awaked. None of us experienced any diſagreeable effects in conſequence of the vertigo, &c. only in going to bed 6 hours afterwards, I felt ſome ſmall remains of the vertigo. Several other perſons have inhaled it ſince; and all were affected in the ſame manner. I have no doubt, from what I have obſerved, that if inhaled in a pure ſtate, this air would ſpeedily bring on fainting and death; when given as a medicine, it ought therefore to be much diluted with common air, I ſhould think, with 12 times its own bulk. Its effects upon diſeaſed lungs you are better qualified to ſpeak to, and truſt you will give the neceſſary cautions for the uſe of ſo active a medicine, in a more diſtinct manner than I am qualified to do.

About the ſame time, I made ſome inflammable air by means of zinc; it contained a very conſiderable quantity of the flowers of that metal in a ſtate of ſuſpenſion, which had the appearance of grey ſmoke, as it was diſcharged from the bellows. I breathed this air 3 or 4 times without being ſenſible of any immediate effect; nor could I have diſtinguiſhed it in that manner from common air, though when I blew it out of my lungs againſt a lighted paper match, it took fire. Next morning I ſpit up ſome mucus very ſolid, and at moſt as elaſtick as caoutchouc, and the ſame in a ſmaller degree the ſecond morning; this I attributed to the calx of zinc, which I apprehend it contains in a ſtate of ſolution, as well as of ſuſpenſion.

Of fixed air, I have little to ſay. I have occaſionally breathed it in larger quantities than were agreeable, and always experienced flying ſtitches in the muſcles of my breaſt in conſequence, but they ſoon left me without any medicinal help.

Conſidering that no ſpecies of artificial air is obtained except water is obviouſly preſent, or that there is reaſon to ſuſpect it may be contained as an element, or part of one of the ſubſtances concerned, and that Dr. Prieſtley obtained fixed air from aerated barytes, by paſſing ſteam over it when in a red hot ſtate, though it would yield none by a mere dry heat, I concluded, that if water or ſteam were applied to calcareous earths when redhot, they would readily part with their fixed air. I put 1½lb. of chalk broken into ſmall pieces into the pot of my apparatus, and, when red hot, admitted ſmall quantities of water. I obtained about 4 cubic feet of fixed air, extremely pungent to the ſmell, and greedily abſorbed by water. The laſt portion was mixed with ſome inflammable air from the iron pot, and the chalk was found to be nearly cauſtic, but had no way changed its form.

This air was free from any ſmell ſimilar to that of aquafortis, which that produced by means of vitriolic acid generally has, and perhaps was more pure.

In purſuance of the ſame idea, I concluded that nitre might yield its dephlogiſticated air leſs reluctantly, if water were added when it was redhot. I put 4 ounces of nitre into an iron pot, and, by mere heat, obtained about 400 cubic inches of air, which, being waſhed in its paſſage through the ſpiral refrigeratory, did not taſte of ſpirit of nitre, though it ſmelled ſlightly of it. Fearing that on the addition of water ſome inflammable air might be produced, and there might be an exploſion, I removed the refrigeratory and bellows, and then admitted ſome water. Air immediately iſſued in quantities from the conducting pipe of the pot; and this air was found, on the application of a match, to be dephlogiſticated; but ſome ſpirit of nitre iſſued at the ſame time, and probably ſome azotic air. The pot was conſiderably corroded by the nitre, which had found an iſſue at ſome defective places, that has hitherto prevented a more complete experiment from being made. It would ſeem, from theſe appearances, that my reaſoning was right, and that nitre may in this way be made to yield all its air in a moderate heat. It ſtill, however, remains a deſideratum to find veſſels which can retain in it a red heat for a ſufficient time.

I put 1½ pound of the Mendip manganeſe you were ſo kind as to ſend me, into the iron pot, and, by dry heat, obtained from it about 1½ cubic foot of air; the firſt and laſt portions ſeemed, by the taſte, and by its extinguiſhing flame, to be fixed air, about half a cubic foot was dephlogiſticated. When it it had ceaſed to give air by that heat, I added water, and obtained a conſiderable quantity of fixed air, ſimilar to that from chalk, but in which a grey powder was ſuſpended in conſiderable quantities, which gave the appearance of ſmoke, as it is iſſued from the bellows. A perſon who breathed a little of this air undiluted, experienced a ſlight vertigo and nauſea. May not this proceed from the powder ſuſpended in it?

The purity of the dephlogiſticated air, which you obtained by means of vitriolic acid from the Exeter manganeſe, may not be wholly owing to its ſuperior purity, but to your mode of diſengaging it; for I apprehend concentrated vitriolic acid will diſengage very little fixed air, even from marble, as it ſoon covers it with a coat of gypſum, which protects it from any further action of the acid. If, therefore, this air can be freed ſufficiently from any taint of the acid, the method you have followed ſeems by much the beſt mode of obtaining it, and perhaps the cheapeſt.

In reſpect to pure azotic air, I have tryed no proceſſes, but the method I mentioned to you in June laſt, of obtaining a mixture of azotic and fixed air from burning charcoal ſucceeded perfectly,

I made a chaffing diſh about 6 inches diameter, and nine inches deep, into one ſide of which, near its middle, there was inſerted a pipe one inch diameter; to this pipe was joined another about 3 feet long, paſſing through a trough filled with water, and connected with the hydraulic bellows, the latter being ſlowly elevated, were filled with the air which had paſſed through the burning charcoal in the chaffing diſh, and this air, upon being poured out of a cup over a lighted candle, extinguiſhed it immediately. Large inhalations were made of it by ſome of my aſſiſtants, without injury to themſelves; but, upon me, it produced effects ſimilar to thoſe of fixed air. Its uſes in medicine I cannot pretend to predict; but if azotic air is found uſeful, this may be given in any caſe, wherein fixed air will not be hurtful.

I remain, dear Sir,

Your's,

James Watt.

To Dr. BEDDOES.

September 24*th*, 1794.

ADDITIONAL DIRECTIONS.

To facilitate the ſeparation of fixed or other acid vapours, a wooden ſtirrer or agitator, in the form of an inverted ⅃, with a ſmall winch on the upper end, and a pivot at bottom is put into the refrigeratory, the ſhank going up through the ſhort pipe left for the exit of the hot water; by mixing ſome quick-lime with the water, and uſing this agitator, all acid vapours will be quickly abſorbed.

Sometimes by ſhaking the apparatus, the joints about the fire tube or pot are apt to become untight. This is cured by luting them on the outſide, with a paſte made of freſh ſlaked lime and linſeed oil, but care muſt be taken not to make the joints with this lute originally; for if it penetrates the inſide, it will give a very bad ſmell to the air.

When oxygene air is produced from Mendip manganeſe by heat, there ought to be a ſmall hole ſtopped by a wire, in the conducting pipe near the refrigeratory, on holding a candle near this hole you will ſee by the brightneſs of the flame, when the manganeſe begins to give oxygene air. The ſmall hole is then to be ſtopped, and the air which has previouſly come over is to be diſcharged from the bellows, and alſo by opening this hole from time to time, you will ſee when the oxygene air ceaſes to be produced; and during its production the agitator ſhould be uſed, to ſeparate the fixed air mixed with it.

(This ingenious idea is applicable to any manganeſe. Perhaps a very ſmall tube, ſoldered firm at right angles into the ſide of the conducting pipe would anſwer beſt. T. B.)

If the oxygene is to be ſeparated from nitre by heat, or from manganeſe by means of vitriolic acid, the kneed receiving pipe of the refrigeratory ſhould be of earthen ware or glaſs, and the conducting pipe from the pot of glaſs. The acids have not a ſpeedy action upon the parts of the refrigeratory which are under water, eſpecially if the water is mixed with lime, as it ought to be in ſuch caſes.

Sept. 27*th*, 1794.

DEPHLOGISTICATED AIR FROM MANGANESE BY HEAT.

Having obtained a ſmall quantity of Exeter Manganeſe, ſince the preceding papers were printed, I am enabled to give ſome directions concerning the proceſs for extricating the air from it by mere heat.—The manganeſe, reduced to a coarſe powder, is to be put into the pot or the fire tube, which are then to be placed in the furnace; and the joints with the capital or end pieces carefully made with the cement of China clay, or quick lime moiſtened with ſaturated ſolution of borax.—The reſt of the apparatus is then to be put together, and the joints of the conducting pipe with the refrigeratory, and of the refrigeratory with the bellows, to be made good with a part of China clay, or whiting, mixed with flour and water, and for farther ſecurity a rag bound round them.—When this is done, the fire is to be lighted, and no more air admitted than will permit it to burn very gently; for a very moderate heat is ſufficient for diſengaging the air.—When the cement of the joints near the fire is dried, they ought to be covered over with the fat lute of lintſeed oil and ſlaked lime, and when that liquifies by the heat, a little dry lime may be applied to it to prevent its running off.—The hole for the water-pipe may either be ſtopped with a plug, or with the water-pipe itſelf, which in that caſe ſhould be filled with water, merely to inſure its being air tight; for it does not ſeem neceſſary to admit water in this proceſs, though it ſeemed rather to accelerate the extrication, it did not appear to increaſe the quantity of the air.—A pound of the hard part of the Exeter manganeſe yields about 1400 cubic inches of air, which appeared highly dephlogiſticated, by its action on the flame of a candle, and free from any taſte or ſmell of fixed air; (I did not ſubmit it to other teſts; the ſtate of my health does not permit me to make experiments with nitrous air.) The ſoft clay-like part of this manganeſe does not yield ſo much air, but what it yields is equally pure.—I had imagined that the fire-tube might be emptied, and freſh manganeſe put in, without removing the tube from the fire, but I find that the manganeſe parts with its air ſo eaſily, that moſt of the air would be loſt before the joints of the tube could be made good again. It is therefore proper to take the tube out of the fire, and let it cool before it is refilled. The fire-tube of the ſmall furnace will hold as much manganeſe as will yield 2 cubic feet of air, and the large tubes or the pot twice as much.

October 2d.

FURTHER ADDITIONAL DIRECTIONS.

This publication being delayed, on account of the engraver's having failed in having the plates ready, at the time he promiſed, gives an opportunity of adding ſome remarks which may be uſeful.

Chalk gives out its fixed air by heat, more readily than marble does, and if it be previouſly broke into bits, about ¼ inch cube, and ſoaked in a large quantity of water, which ſhould be once or twice changed, there will be no danger of the purity of the air being degraded by marine acid, or other heterogeneous matters.

Half a pound of dove-coloured marble yielded about 1½ cubic foot of air, of which 2-3ds were abſorbed by lime water, and part of the remaining third was inflammable. This air had an extremely bad ſmell, probably owing to the colouring matter of the marble.—Statuary marble has not been tried by me in this way.—Neither very great heat nor much water ſeem neceſſary in this proceſs.—The marble gave out its air much more ſlowly than the chalk.

It has been mentioned that two different ſizes of this pneumatic apparatus are made; the larger has been recommended for hoſpitals, apothecaries, and others who want large quantities of the airs, and the ſmaller for the uſe of private perſons.

On trial it appears, that the ſmaller furnace, with its fire tubes, anſwers much better than was expected, and that it may be very well conjoined with the larger bellows and refrigeratory, for thoſe who do not want *very* great quantities of air. The ſmall fire tubes will hold about three pounds of Manganeſe, which if it be of the Exeter kind will make about two cubic feet of dephlogiſticated air. Theſe tubes will hold about one pound and a half of chalk, which will yield about four cubic feet of fixed air; they will hold about two pounds of hammered iron turnings, which makes a large quantity of inflammable air, and their contents of charcoal will laſt ſome hours, making a cubic foot of air in 6 or 8 minutes.

It is only in making the air from zinc that they are deficient; that metal ſublimes and ſtops up the end pieces; for this purpoſe the pot ſeems neceſſary; but the pot can be heated in a temporary furnace of looſe bricks, which renders it unneceſſary to have the large furnace on that account.

The fire tubes of the larger furnace being three inches inſide diameter, and having 14 inches in length expoſed to the fire, will hold large quantities of the materials, and will probably make proportional produces of air, but tubes of this ſize have not yet been tried; thoſe of two inches diameter have been tried in this furnace and anſwer very well.

As ſilk bags are coſtly and not very durable, it is thought that the larger bellows may be uſed to breathe the mixed airs out of; for this purpoſe a flexible tube with a mouth-piece ſhould be inſerted into one of the pipes at bottom of the bellows; ſo that the patient may not be confined to one poſture while inſpiring the air. Theſe tubes may either be made of caoutchouc, according to a proceſs deſcribed by Mr. Groſſart in the Annales de Chemie, a tranſlation of which is contained in the three firſt numbers of the Repertory of Arts and Manufactures now publiſhing in London, or they may be made of the new water-proof leather for boots and ſhoes.—The leather ſhould firſt be deprived of its ſmell, by the means directed for the oiled ſilk, then ſowed up neatly upon a mould by a ſhoemaker, and the ſeam varniſhed with japanners' gold ſize diluted with oil of turpentine; if the tube be more than half an inch diameter, it ſhould be ſowed together upon a ſpiral of braſs wire, to prevent its cruſhing in bending, or if any noxious qualities be feared from the wire, a thin ſtrip of whalebone may be uſed, or ſtrips of the oſier, of which fine baſkets are made. In any caſe there ſhould be a wooden mould within the wire, until it is ſowed up.—Where the water-proof leather cannot be had, good tanned calf leather may be uſed, and it may be made air tight by anointing it warm, with the following compoſition, taking care to ſoak it well in, by help of the heat.

Take Bees wax one ounce.
White roſin one quarter of an ounce.
Olive oil half a drachm.
Oil of turpentine 3 ounces.

Diſſolve the other ingredients in the oil of turpentine by heat, and always warm it before you uſe it.

Some excuſe ſhould be made to the publick for the deſultory and incorrect manner in which theſe directions are written. The truth is, the ſubject was nearly new to me, my knowledge has advanced in conſequence of experiments, and I have therefore added whatever I thought might be uſeful, as it occurred, and I have been more ſtudious of things than of words. As they are, I hope they will be of ſome uſe, and in that caſe, I ſhall feel amply rewarded for my labour and attention.

James Watt.

N. B. Thin oiled ſilk, though well oiled, I have not found to anſwer ſo well as thick. I have directed an hydraulic bellows of 2 or 3 cubic feet contents, for patients to breathe out of, and think this preferable to oiled ſilk bags. Both will be uſeful. I am diſpoſed to think, that, with the advantage of being ſo much cheaper, oiled linen will do nearly as well as ſilk for bags. Whether of linen or ſilk, they ſhould be hung up by a ſtring tied round the neck, and, when uſed, ſhould be as little creaſed as poſſible. T. B.

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HYPER-CRITICISM.

IN the whole art of reviewing books, no rule ſeems more uſeful than the following: *When you would appear wondrous wiſe, ſubſtitute ſome different ſenſe in place of that of the Author; and then proceed, according to your ſect or humour, to inflict criticiſm upon your own miſrepreſentation.* In the CRITICAL REVIEW for September, 1794, p. 9. there occurs a pretty exemplification of this canon. Here it is: "Dr. Beddoes, "in his introductory letter to Dr. Black, obſerves: *You "have heard the project vilified. So would a Panacea be. So "was the Peruvian bark; and inoculation; and every great "improvement of that art, from which, according to its ſtate, all "in their turn ſhall experience good or harm.* This, however, "is a mode of reaſoning which may with equal propriety be "adopted by every perſon who wiſhes to impreſs a novelty "on the public. The public did very wiſely in declining "the uſe of inoculation and Peruvian bark, till their utility "was confirmed by facts." Here, equitable reader! decide whether contradiction is not founded upon ſome ſuppoſed aſſertion abſolutely foreign from the text. "The project," ſays the author, "has been vilified or condemned before trial." You talk unreaſonably, rejoins the critic, *for*, in the uſe of medicines, is it not right to be governed by experience?—This rejoinder is evidently inapplicable; becauſe thoſe quick-witted Doctors who condemn a new propoſal at firſt hearing, are quite a different ſort of people from ſuch as, with a deſire for knowledge, abide the reſult of experience. Among theſe ſlow-minded men, the author ranks himſelf. He is obliged to wait for evidence before he forms any opinion concerning the virtues of elaſtic fluids. He avows, however, ſome ſcorn for that pretended wiſdom, which declines the uſe of a new remedy, where the patient is ſure to die, if nothing beyond the common routine is attempted. He believes it rather probable, that if her hands are ſo bound, Medicine will for ever remain as helpleſs as at preſent. Had Dr. B. lived in the middle of the 17th century, he certainly had not been ſo very wiſe as to decline the uſe of the Peruvian bark in intermittents. Again, what does this reviewer mean by *the Public?* If inoculation and the bark had been generally rejected, whence were facts to come in evidence of their efficacy or inefficacy? If the public is here put for all but a few practitioners, why ſhould the means of acquiring certainty be limited? Is not induction the ſafer, the larger?

The following profound ſentence ſeems to involve another equally warrantable aſſumption: "In reviewing two "former works of Dr. Beddoes, publiſhed with a view to

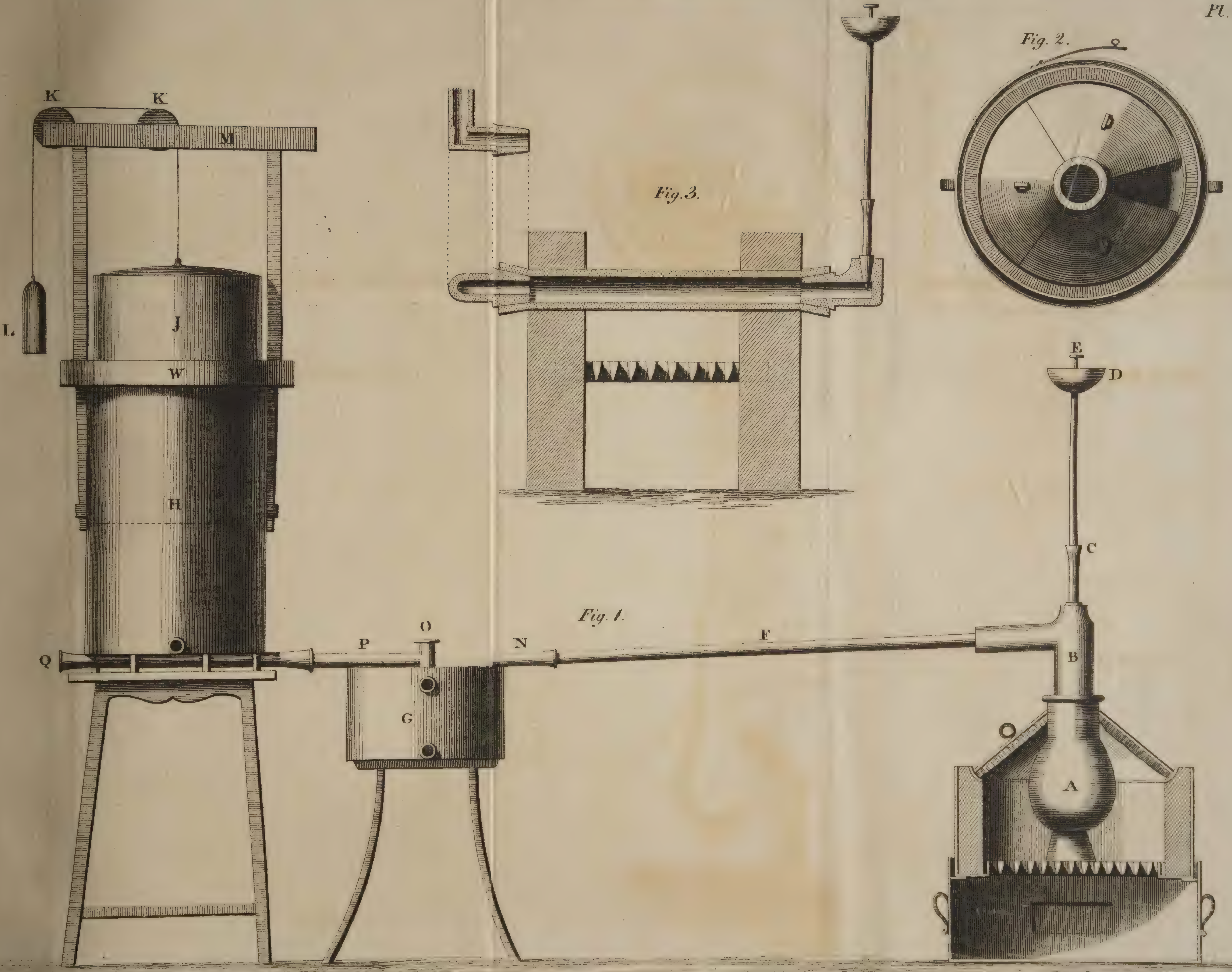
" introduce his pneumatic method of curing diſeaſes, WE " remarked that *decided facts* were wanting to recommend " it. The ſame paucity is ſtill evident (ibid. page 5.")." Now in the firſt of theſe publications, Dr. B. had only offered conjectures; he did not pretend to adduce facts, having then made no trial. In the 2d having found the project practicable, he announced it as ſuch. He wiſhed to incite men of ſcience and ingenious phyſicians to aſſiſt in this moſt important inveſtigation, confidently hoping, that ſome valuable diſcovery would be made, and theſe hopes have been already realized. At the time of that 2d publication, he had only made one imperfect trial, which was rather favourable; he deſcribed it as the only one. What ſagacity, therefore. in the critic who could perceive a *paucity* of facts in theſe publications! It is further ſaid, (p. 9.) " Dr. B. has no right to take it ill that his new method is " not received with an ardour equal to that with which it " is offered." The ſentiment theſe words imply, Dr. B. diſavows. Encouraged by many ſuperior men, diſcouraged by no one individual of approved talents, and feebly oppoſed by dullneſs, he infers from the reception of his propoſal, a prevailing diſpoſition in favour of uſeful, though bold, deſigns. He agrees with thoſe, who are for diſregarding negligence and moderate malice in reviews. But falſe repreſentations ſeem to deſerve the ſhame of public contradiction. Should this retort, however, to which the writer was tempted by a blank leaf, offend any reader, he may cut it out, and burn or otherwiſe deſtroy it, without mutilating the pamphlet.

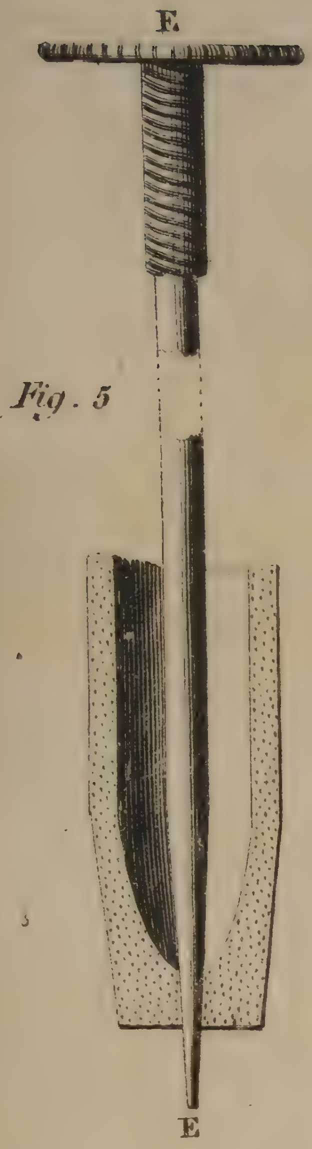
This perſonal diſcuſſion ſhall cloſe with an hint towards the improvement of literary journals, which, when well conducted, are unqueſtionably uſeful.—— Were a new Review to be eſtabliſhed, it might be named THE CRITIC AND HYPERCRITIC. The firſt part might be ſimilar to the preſent Reviews, but ſhould exhibit a fuller view of foreign literature. The ſecond ſhould conſiſt of ſuch replies, literally given, as the author or any of his friends ſhould chooſe to make to any criticiſm in any Review, he, the ſaid remonſtrant, paying the whole expence of this part of the publication. The *Jena* Journal, (by far the beſt upon the Continent) is on ſome ſuch plan. The conſequences attending this arrangement would be theſe. 1. The reader would have more matter for his money. 2. Where the author and reviewer were keen dialecticians, they would make good ſport. 3. With this check, books would be always read and commonly underſtood by their Reviewers.

E N D.

Page 6, line 31, *for* 1785, *read* 1795.—P. 23, l. 41, after *was*, r. *as*.—P. 32, l. 3, after *him*, r. *from*.——PART II. p. 12, for *U*, r. *V*.—P. 19, l. 28, for *and*, r. *it*.—P. 21, l. 32, for *in it*, r. *it in*.—P. 20, l. 25, for *at moſt*, r. *almoſt*.

Pl. 1.





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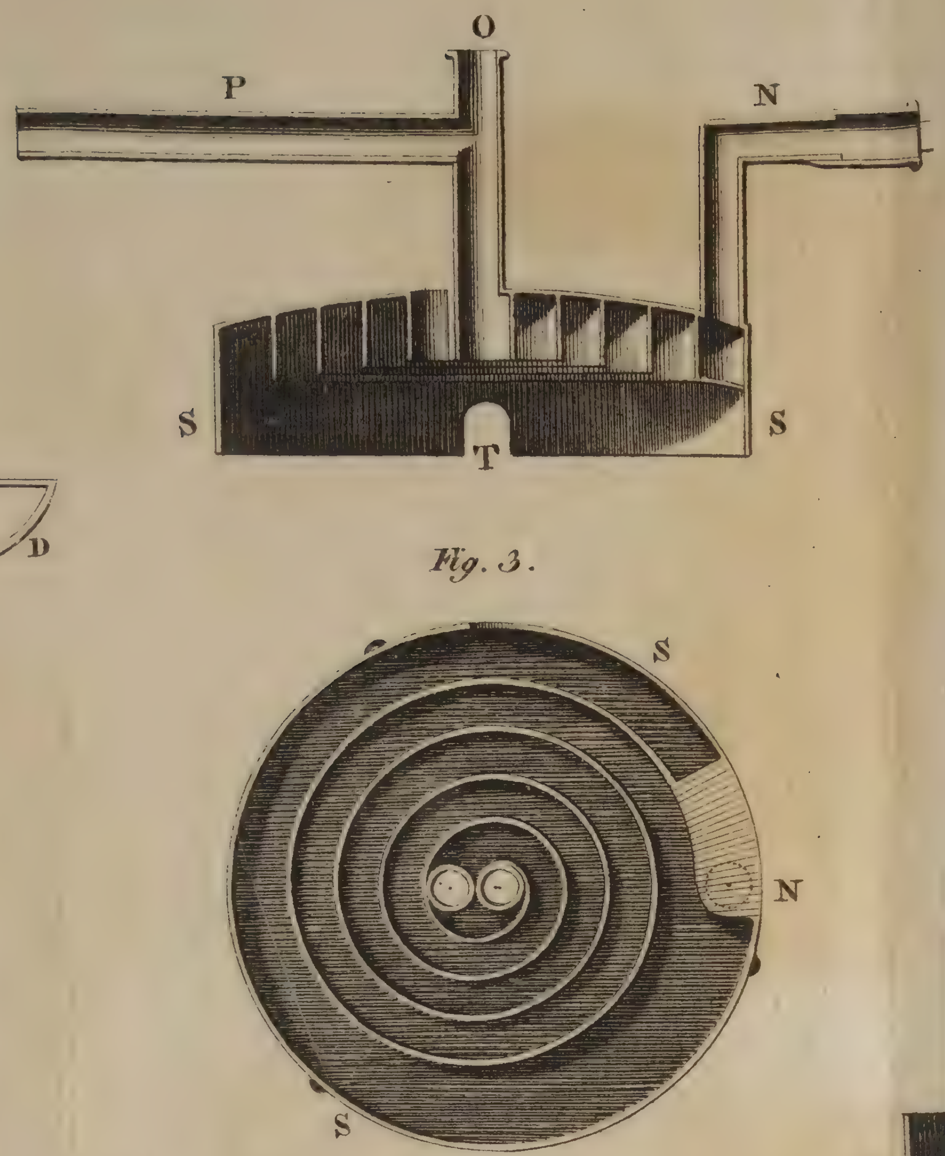

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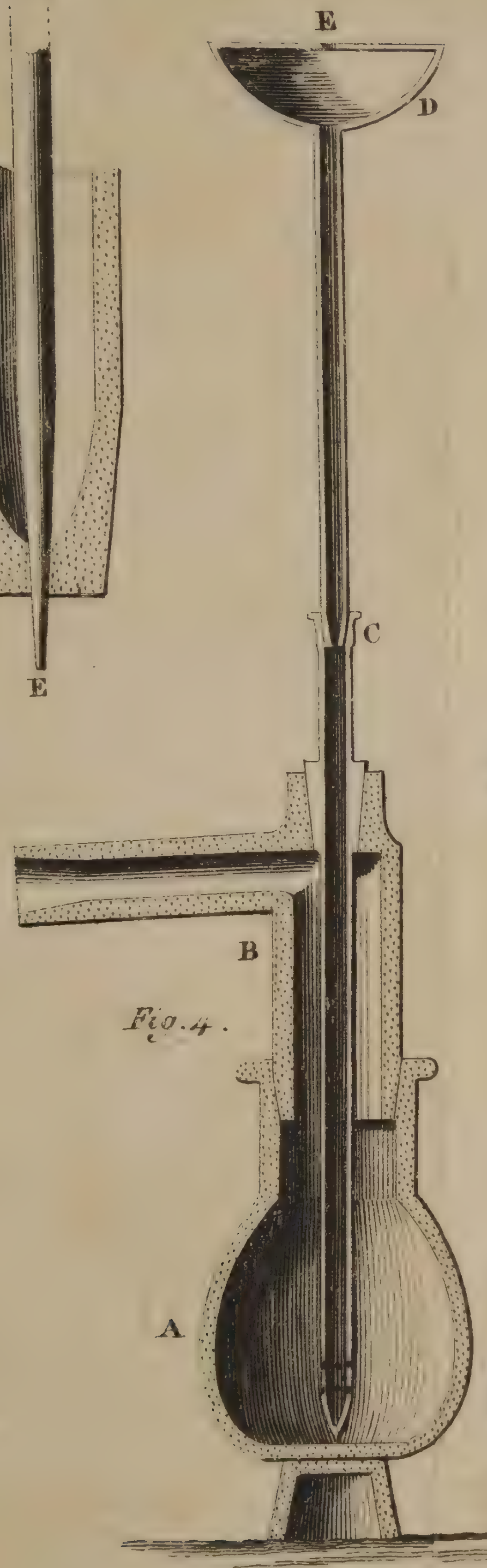

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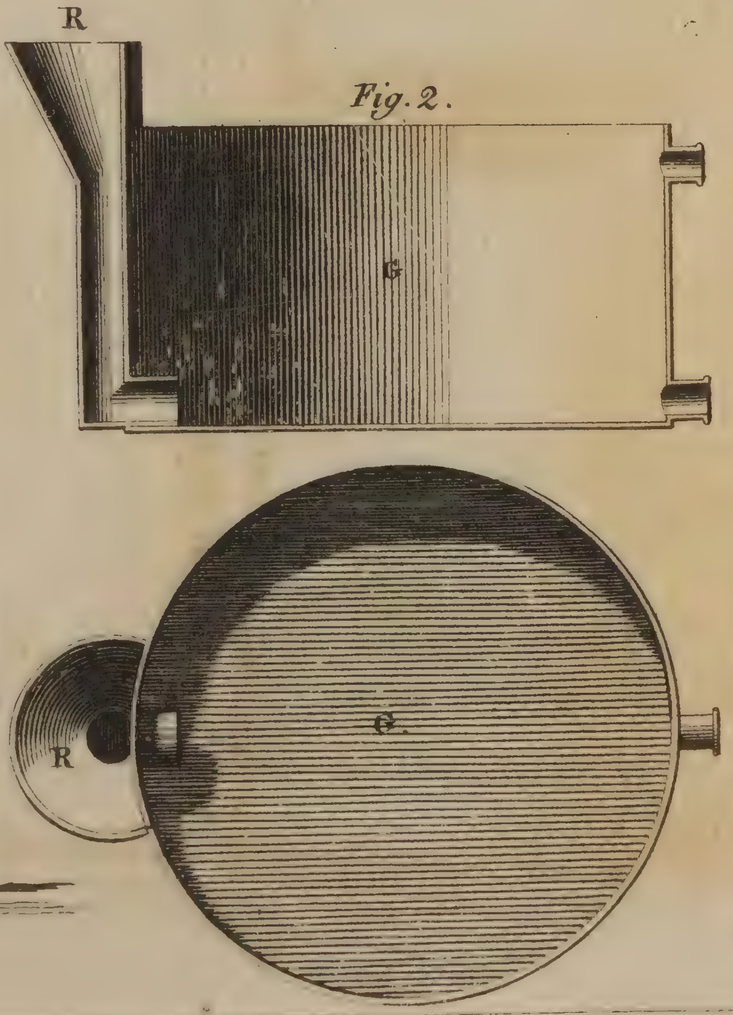

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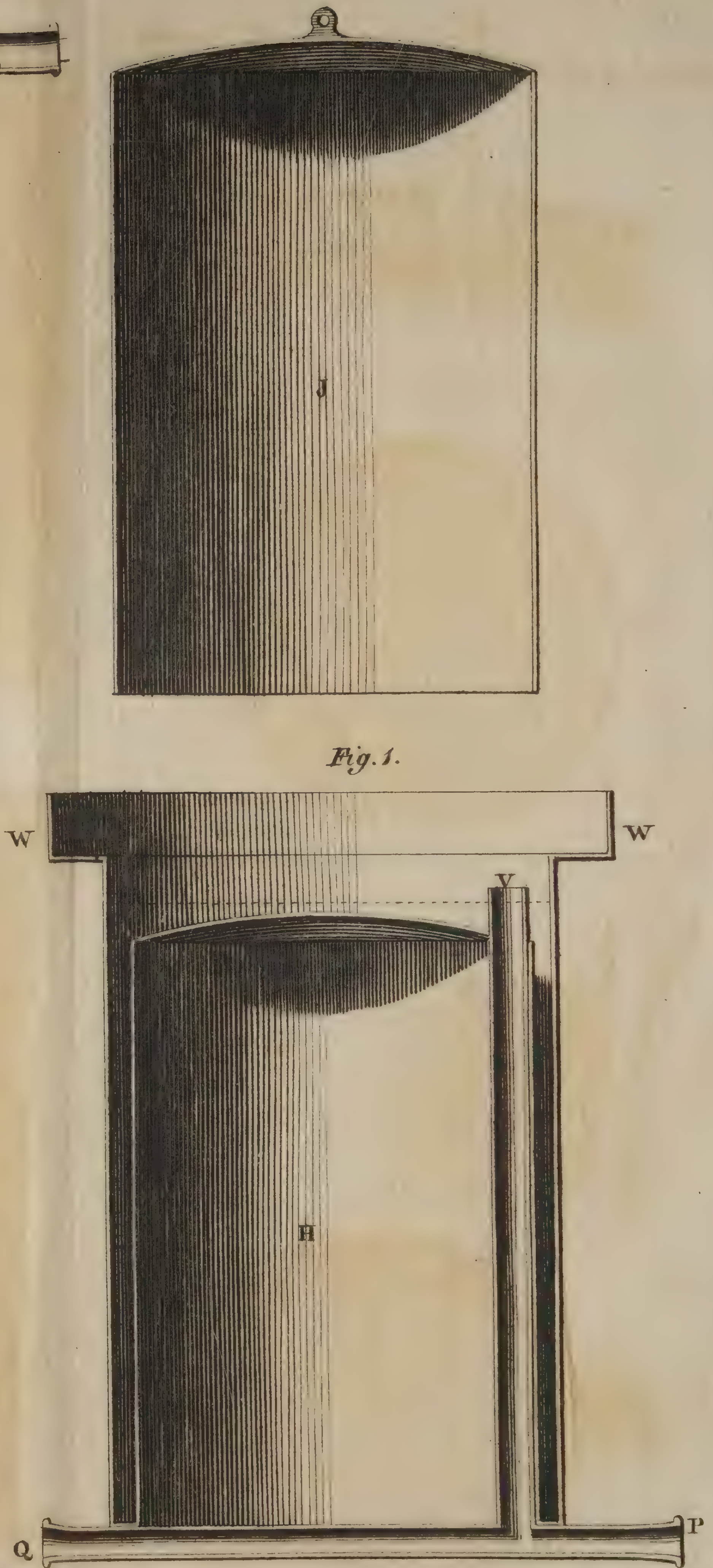

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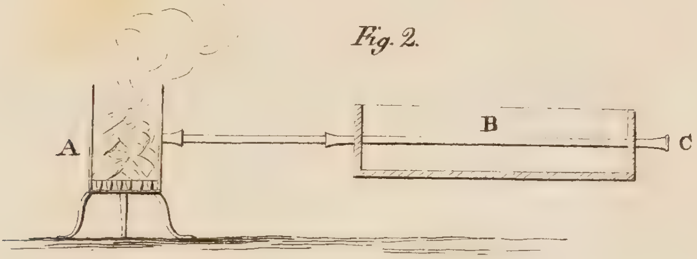

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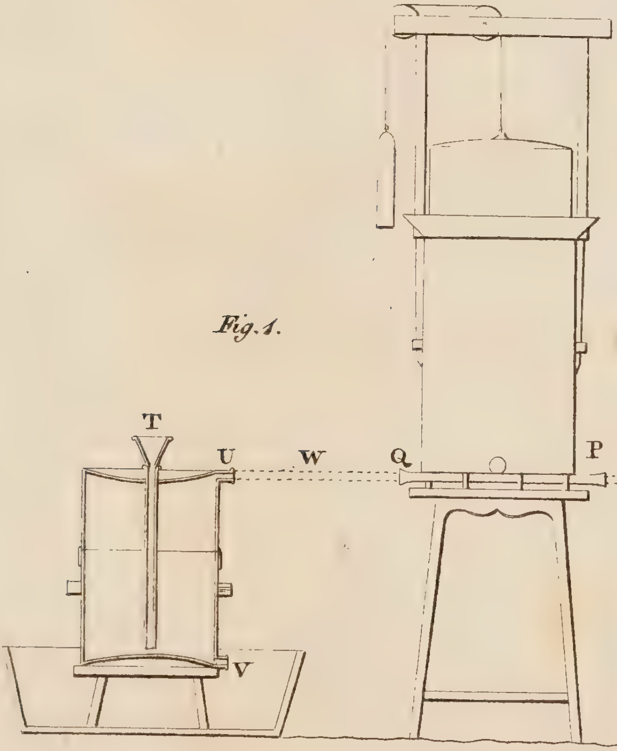

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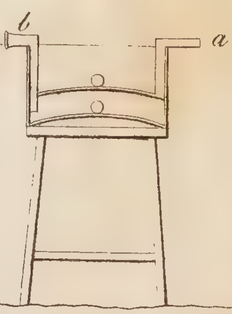

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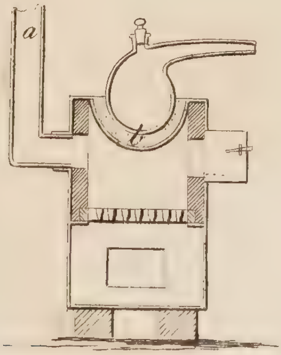

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AND

PRODUCTION

OF

FACTITIOUS AIRS.

BY

THOMAS BEDDOES, M. D.

AND

JAMES WATT, *Engineer.*

PART III.

BRISTOL:

PRINTED BY BULGIN AND ROSSER;

For J. JOHNSON, in St. Paul's Church-Yard, London.

1795.

THIS letter was not in my hands till those which follow it were printed. The sagacious writer, however, communicates matters so worthy of regard, that I am glad the post of honour, where it will have the fresh attention of the reader, should have fallen to its lot. T. B.

* * *

Letter from Sir JEREMIAH MORRISON, Bart. M.D. *to* Dr. DANIEL LORIMER RENSHAW.

My long-esteemed Lorimer,

WHO ſo well as you can tell how often the ſoul of your octogenarian friend has been ſore at the ſcandals of the times? ABSURDITY, I have frequently thought, ſet out on her travels ſoon after we ſtarted from College together (I to ſuperior wealth and conſideration perhaps, you to rural eaſe and a life of leſs contention) and ſhe has nearly completed the round of medical erudition. I *see*, as I am apt to ſay, and I *foresee*. I ſee the degradation of our art, and I foreſee its extinction. I remember the day when it had ſolidity—not without ſolemnity. I have lived till alas! I may repeat after the Poet

——*Miscuit ima*
Summis longa dies.——

All is now levity, doubt, diſtraction, chaos. Does not the Apothecary tread on the very heels of the Doctor; or rather does he not carry himſelf as *hail-fellow-well met!* Now if the *dispenser* turn *prescriber*, will not the *prescriber*, I pray you, be neceſſitated by and by to turn *dispenser* in his own defence? Where will the dignity of our faculty and function be then?—But this is preciſely what I predicted. You muſt recollect it—I am ſure you muſt—It was when certain coxcombs, unworthy to be ſaluted by us as *brethren*, threw aſide the cane, the peruke, and the other diſtinguiſhing inſignia of the profeſſion. Well, what comes next? did I not anticipate that alſo? To a change of dreſs ſucceeds a change of deportment. The flippancy of folly introduces the familiar faſhion of making the very patient a party to the preſcription---This they call *openness*, *candour*, but you and I have never dealt in any ſuch openneſs. We have upheld the ſeverity of a graver age. We never gave into this laxity of practice. Had Boerhaave himſelf given into it, ſhould we ever, I pray, have numbered the *crumb-of-bread pill*, among that great man's happieſt inventions?

Seeing into what confuſion things have run, why ſhould we be ſurpriſed if the *licentiate* comport himſelf as if he were on a par with the *fellow?* Why wonder, that we who have been matured in the regular diſcipline of epiſcopalian univerſities, ſhould be held in ſcarce higher eſtimation than thoſe who have but juſt had time to lick up a mouthful of the huſks of ſcience at ſome preſbyterian ſeminary in the North?

In our early days, when the practitioner propoſed to himſelf either to attenuate or reſolve, or inviſcate, or obtund; and when he had opened theſe his *indications*—not indiſcreetly, no, *nequid nimis*— to the proper parties, was not as full reliance placed upon his inſight, as if he had given them the cauſe of the diſeaſe to hold in the palm of the hand? Wherever he appeared, did he not inſpire reverence? the friends—were they not all expectation; the attendants---all ſubmiſſion; the patient---all reſignation? and he felt comfort even in reſigning his breath; ſo decorouſly was the art exerciſed in its minuteſt particulars!

But now—nor will you, my valued hippocratic friend, call me croaker---ſuch has been the effect of *candour*, diſcuſſion, and the univerſal uſe of the vernacular idiom in medical writings, that I queſtion whether *acrimonies vellicating within, and peccant humours burſting their way out*, will paſs much longer, except with gentlewomen about our own ſtanding; though they once could give ſuch univerſal ſatisfaction as to the cauſe of ſymptoms.

Partial friends—you among the reſt—will ſometimes perſuade me that my tracts are models of claſſic elegance, too good for a taſteleſs generation, and therefore not in ſuch high requeſt as they deſerve. In point of years you are *a little* the younger man, and *not a little* in point of conſtitution; you may therefore live to ſee an opportunity of bringing the faculty to a juſter ſenſe of things. Should you at ſuch a moment (excuſe the vanity of my ſuppoſition) think it worth while to revive theſe my lucubrations; and ſhould friendſhip induce you to prefix ſome memorials of the author, extracts from my correſpondence on various occaſions of alarm, *ne quid ars detrimenti capiat*, may, *poſſibly*, not be out of ſeaſon. You will, I flatter myſelf, find ſomething upon moſt painſworthy points. I will not, I need not, direct *you*, to thoſe which I have moſt happily touched. But do not, I intreat you, omit my kind commendations of thoſe SAGES who have ſucceſſively undertaken to ſhew that there is *no* *sedative virtue in opium, no despumation in the small-pox, no erosive acrimony in pus, no putrefaction of the fluids in any disease, and no vires medicatrices naturæ in any constitution.* Digreſſively, I believe I may have thrown out ſome ſtrictures upon thoſe other modern teachers to whom the world is indebted for the information that there is neither *free-will in man, nor phlogiston in charcoal.*

Sed hæc missa faciamus---let this buſineſs paſs for the preſent.—-*Gravius instat—periculum* ſhall I add? I ſhould think the term too grave if I had not ſeen equally contemptible beginnings proceed to an iſſue, which it gives me a pang to recollect. *You* thought the difficulty of execution quite ſufficient, and that we need not interfere to diſcountenance----But you now ſee the project, extravagant as it is, can hardly be claſſed among the *dead-born.* From what I hear—*auribus invitis* you may ſwear—even at the Weſt end of the town, I am apt to apprehend ſometimes that it is creeping on and gaining ſtrength.

I do not argue—arguing on ſuch a ſubject I conſider as *infra dignitatem.* Neither do I deſcend to invective, though my indignation be indeed, at times, held in with difficulty. But did you know all, you would ſee that I can ſtrike a home-blow nevertheleſs. I will explain by an inſtance or two.

Some ſhort time ago after diſpatching the buſineſs on hand, and aſking of the apothecary a few ſlight queſtions about what they call the *yellow* bark, I roſe to go to my carriage. At the door of the room where we had been cloſetted, I ſtopped, turned round my head, and looking ſignificantly ſaid, " well, Mr. DRENCH, perhaps " you may deal with an additional ſpecies of " cortex; intruſions of this kind muſt be ſubmit-" ted to; but have you contrived how you are " to put theſe new *aerial remedies* into ſaline " draughts?" I walked off without waiting for his anſwer, but the next time we met, he ſaid he had reported my queſtion at his pharmaceutical club; and that it not only made the matter *clear** to the underſtanding of the members, but created an hearty laugh into the bargain—You will, I am certain, prefer this mode of attaining the ſame end to that of ———, the apothecary, who being told that one of his patients had been perſuaded to take the vital air, hurried to his houſe and indignantly demanded whether this was really his determination. " If " ſo, ſays he, " here is your bill, and if it be " not paid, I will arreſt you to-morrow."-—

---

*If Mr. Drench did not flatter his old friend the Baronet, the heads of the members could not be very *clear*, ſince nothing hinders pharmaceutical gentlemen from diſpenſing airs and they may be conjoined with drugs. T. B.

This was no doubt excellently intended, but was it not too direct? It was the more unlucky, as the patient recovered—by the power of nature beyond a doubt, not by the help of the new-fangled remedy he took.

Well; ſoon afterwards, the conſumptive daughter of Sir ——— ———, who had been under my care for ſome weeks, was ordered to the Hotwells. Sir ——— aſked if he ſhould conſult ———, naming the man, out of whoſe hands, I am moſt decidedly of opinion, that all phyſicians, who have the ſtate and ſtability of their profeſſion at heart, ſhould unite to keep patients. "*To be sure*," I replied, the diſeaſe "is always fatal. It is, *in truth*, the very "ſcourge of our iſland. *Would to God* ſome "better means were deviſed—Reſearches for "this purpoſe are *out of all question* laudable. "I *most heartily* wiſh them ſucceſs." Having thus tuned their minds to confidence with my key of candour, "but would you, Sir ———," added I emphatically, "or *you*, my lady, have "*experiments* made on your daughter?" My lady ſhuddered at the queſtion; ſhe even ſtarted, nor could her countenance have expreſſed more horror, if ſhe had actually beheld her daughter in the hands of an aſſaſſin. I will anſwer for it, no *experiment* is performed on this patient.

So much---and enough for example's ſake. A great deal more occurs. The topic is fertile---but *verbum sapienti*.---The new practice will be applied to deſperate caſes principally; and as it can never ſave all the dying, you may conceive we ſhall have plenty of texts for *useful* comments; for it is always our own fault if thoſe who employ *new* remedies without effect, do not appear to diſadvantage, though *we* can do no better with the *old*. All depends on the face we put upon the matter.

Then you know there is the topic of *inexperience*---on this *we* may launch out. We may call aloud for facts, and all the while reject any that ſhall be offered. Naming no names—remember that---let us uſe ſtrong deſignations, as *speculatists*, *enthusiasts*, *high-flyers*. Such language, in the proper tone, will hurry away the mind of the hearer, in ſpite both of his previous conviction and of the guarded terms in which *they* may have expreſſed themſelves.——Beſides how eaſy is it to ſet *Rumour* at work! And if we could condeſcend to look upon *them* as adverſaries, what would this be but juſt retaliation? for you may obſerve in their publications an inſolent neglect of us, who are at the head of the profeſſion; nothing ſoothing, nothing conciliatory---no acknowledgment of our ſuperior ſagacity---no deference to our experience. On the contrary, appeals to common ſenſe---a deſign to take public opinion by ſtorm---in ſhort a ſpirit that requires no leſs to be repreſſed than it deſerves to be reprehended.

I had hoped to encloſe, according to your preſſing requeſt, the lines, ending

PROCEED, high-toned enthuſiaſt! coax mankind
With idiot mouth to gape and ſuck the wind;
To each forſaken belle and faded beau,
In Hope's gay glaſs alluring viſions ſhew.
Teach in terſe phraſe how *chemic airs* can ſpread
O'er the wan cheek the roſe's opening red:
Smooth the dull brow: new ſcoop the dimpled cell
Where once a ſmiling Cupid loved to dwell:
In the dim orb the glance of youth relume,
And o'er the features breathe Promethean bloom.
Nor boaſt *thy airs* coſmetic powers alone:
Diſeaſe and vanquiſhed Time their virtues own.
Pneumatic art unfixes Cancer's claw,
And ſhields the victim doomed to Phthiſis' maw.
See Palſy dance! his hollows Macies fill,
And Aſthma pace without a puff up hill!

IF but three thouſand pounds obey thy call,
Mankind ſhall mourn no more old Adam's fall.
Thenceforward—blooming through a ſecond ſpring—
Tenfold the race aſſigned by Iſrael's King
Eve's half-immortal progeny ſhall run
And new METHUSALEMS ſurpriſe the ſun!

——But you muſt adminiſter a lenitive to your curioſity. For my ſtiff old jade mounts ſlowly up the ſteeps of Parnaſſus. I am every now and then as much puzzled for a rhime, as a raw officinal recruit to lay his hand on the right box. Farewell! a friendſhip of fifty years cannot require valedictory aſſeverations.

JERE. MORRISON.

June, 1795.

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CASES
IN ELUCIDATION
OF THE
MEDICINAL EFFECTS
OF
FACTITIOUS AIRS.

HAVING been informed that SIR WM. CHAMBERS, *when labouring under the pressure of unspeakable distress, had derived more than present relief from oxygene air, I requested from him an account of the effects he had experienced from its use. In the 2d Ed. of my* CONSIDERATIONS, p. 158. *I have related my observations in a case of dropsy of the chest. In this case, oxygene air seemed repeatedly to remove the nausea, and for a short time the difficulty of breathing. But it had no effect in emptying the cellular substance of its water, or preventing its accumulation after it had been evacuated by foxglove.*

This is one of those diseases in which I most wish for rooms filled with modified air; as from the diminished capacity of the air-cells, an atmosphere with more oxygene would only bring the patients to an equality with healthy persons, in respect to the quantity of oxygene acting upon the blood, during its passage through the lungs.

T. B.

Letter from SIR WILLIAM CHAMBERS, *Knight of the Polar Star, F. A. S. &c. &c.*

June 20, 1795.

SIR,

AS every perſon of a benevolent mind and enlarged underſtanding muſt approve of the deſign of thoſe gentlemen, who are endeavouring from a philoſophic induction, to introduce aerial remedies for the removal of otherwiſe incurable diſeaſes, and as my caſe appears ſuch as to demonſtrate the efficacy of the vital air in a diſorder, that has hitherto reſiſted the ableſt practitioners in phyſic, I will attempt, as far as lies in my power, to deſcribe my ſituation, and the effects, which I experienced from this new remedy; I ſhall be truly happy, ſhould the ſame advantages be felt by others under ſimilar circumſtances.

Previous to my coming under Dr. Thornton's care, every means which extenſive experience and great abilities could ſuggeſt, had been tried by my friend Dr. Turton. My complaint ſeemed to be of ſuch a nature, as to baffle all the powers of art. I was at that time hardly able to move from one chair to another. It was with the utmoſt difficulty I could get up ſtairs. I had water in both my lower extremities, and great oppreſſion on my breath, ſo that when I lay down to ſleep, I was frequently obliged to ſtart up and reſume an upright poſture, to prevent myſelf from being, as it were, ſuffocated. My nights were bad, my appetite gone, and for months I had not been able to ſwallow any thing ſolid. Indeed I had given myſelf up as a loſt man, until I heard of the vital air, which my friends told me had done ſuch extraordinary things in medicine and ſurgery. I conceived that as the application was to the ſeat of the diſeaſe, it promiſed more than moſt other remedies, and accordingly about ten months back I began the inhalation of this air. Dr. Thornton approved of the plan of medicine I was purſuing, which was, bitters to ſtrengthen the ſyſtem, and as occaſion might require, a warm laxative pill; theſe were therefore continued. After a few weeks' trial of this new mode of treatment by the vital air, the above medicines being continued, my ſtrength was ſo far recruited, that from my own reckoning, I could walk upwards of two miles; my ancles did not pit; my breathing was relieved; my appetite improved and my countenance ſo much mended; that all my friends, together with my phyſician, congratulated me on my recovery. I was able to pay my reſpects to his Majeſty, who complimented me much on my good looks, and made many inquiries reſpecting the vital air. I was enabled regularly to attend the Board. But I had to battle through ſuch a winter, as few at my time of life have been able to ſupport. The influenza, which was general, was a great drawback to my full reſtoration, as the vital air was obliged to be deſiſted from at that time, and recourſe was had to evacuants, cooling medicines, bliſters, cupping, and a low diet. But this, together with ſeveral colds, that have occaſionally attacked me, has, in my mind, only manifeſted the more the efficacy of the vital air in my complaint, for as ſoon as it has been judged prudent to have again recourſe to the vital air, the ſymptoms that had gained ground during the intermiſſion, have been as conſtantly ſubdued, and my friend Dr. Turton has told me, " that I could not do better "than to go back to the vital air," to which I do not heſitate to aſcribe my preſent freedom from oppreſſive reſpiration, comfortable nights, clean ancles, power of eating ſolids, with appetite, and in a few words, as much return of health, as a perſon at my time of life (85) has reaſon to expect after ſuch an attack, and I think abundantly ſufficient to be thankful for, and to prove the virtue of the vital air in all complaints of this nature; but this I muſt leave to you, Dr. Thornton, and others to determine, to whom I ſincerely wiſh every ſucceſs in your laudable attempts to leſſen the afflictions of mankind, and have the honor to be,

Dear Sir,

Your obedient humble Servant,

WILLIAM CHAMBERS.

To Dr Beddoes.

Obſervations on this Case, by DR. THORNTON.

1. AS the average doſe was 1,500 cubic inches of atmoſpheric air, ſuper-oxygenated, at firſt by one, and afterwards by two quarts of *vital air*; does not this caſe of Anaſarca prove, that ſuch a mixture has no contemptible power?

2. As the ſuper-oxygenated air was inhaled at firſt, for near two months ſucceſſively, once each day; and afterwards for eight months, three or four times a week, it ſeems to prove, that this remedy may be employed for a great length of time without injury; care being taken to leave it off when any accidental inflammatory attack ſupervenes, and when the tongue has a white appearance, in the ſame way as bark and all other tonic and exciting remedies would be omitted under ſimilar indications.

3. After the inhalation of the ſuper-oxygenated air (the quantity of air uſually drawn into the lungs being 4 pints at a forced inſpiration) a ſenſe of warmth was diffuſed throughout the body; Sir William Chambers frequently noticed that the extremities of his fingers, which were before colourleſs, were ſuffuſed with red blood; the ſmall veſſels on the ſurface of the cheeks became more florid; the veins filled out; and the pulſe which was 90, and weak, roſe in fulneſs, but diminiſhed in quantity, from ſix to ten in a minute.

4. Is the removal of the Anaſarca; the recovery of muſcular power; the increaſe of ſtrength; to be aſcribed ſolely to the inhalation of a ſuper-oxygenated air?—to the power of tonic remedies?—or to both conjointly?

To the laſt opinion, from an experience of above two years in the pneumatic remedies, I ſubſcribe, but this will be more ſatisfactorily determined by your *Pneumatic Inſtitution.*

5. Was not a deficiency of vital air in the ſyſtem, ſhewn not only from the nature of this diſeaſe; from incapacity for muſcular action; coldneſs of the extremities; defect of colour, which was natural to the cheeks in the ſtate of health; but alſo from the tremulous motion of the hand, when holding the tube connected with the machine for the inhalation of the air; for theſe went off in proportion as the ſyſtem became oxygenated.

6. As the uſual remedies are employed, which the prudent Phyſician preſcribes according to the circumſtances of the caſe; and as the patient loſes no chance in the experiment, and the ſuper-oxygenated air in a ſtate of great dilution, is proved to be by no means a dangerous remedy; have not practitioners great reaſon for adopting in future *this new power* under ſimilar circumſtances?

R. I. T.

7. As patients in general, though warned to the contrary, make greater efforts of reſpiration, when they draw the air out of a reſervoir, does not the ſame quantity of atmoſpheric air oxygenate the ſyſtem more in this mode of adminiſtering it than in ordinary breathing? and may not the exerciſe attending this mode of reſpiration be of ſervice? This laſt circumſtance deſerves attention.

T. B.

Letter from SAMUEL HILL, ESQ.

June, 20, 1795, *Great Suffolk-ſtreet.*

SIR,

I ACKNOWLEDGE the honour of your letter, and make not the ſmalleſt heſitation in complying with your requeſt.

Mary Leucraft, the daughter of a tenant of mine, had been ill above three years. Every thing had been tried for her recovery, as far as her mother's reſources would allow of, but her body ſtill remained greatly ſwelled, and ſhe had that ſallow, and, if I may be allowed the expreſſion, flabby appearance, characteriſtic of a perſon in the worſt ſtate of health. As her diſorder had been all along pronounced dropſy, and ſhe had received no benefit from medicine, her mother told me, ſhe had given up every hope of ever ſeeing her child recover; but well knowing the humanity of Dr. Thornton, and thinking, that this caſe would if ſucceſsful, do great credit to the aerial remedy; I ſent her with a letter of recommendation to that Phyſician. She was accepted as a patient, and I ſoon heard ſhe was getting better, and when I ſaw her, I was convinced that ſuch was the caſe; but her mother at this time falling ſick, and being unable to bring her daughter to Dr. Thornton, or to ſpare her from home, ſhe again relapſed into her former condition of ill health. However, upon the recovery of her mother, ſhe renewed her daily attendance.

In about ſix weeks ſhe came to return me, and the ladies belonging to my family, thanks; and we were, I muſt confeſs all of us aſtoniſhed at the change; for from being an object of pity, ſhe was now become of her proper ſize; ſhe ſaid ſhe had an appetite; ſlept well; and ſhe had a moſt blooming complexion.

I have the honour to be, Sir,

With the greateſt reſpect,

Your obedient humble Servant,

SAMUEL HILL.

To Dr. Beddoes.

Observations by DR. THORNTON.

IN this caſe, I evacuated the bowels with rhubarb and cream of tartar, to diſcharge the water and accumulate irritability in the abſorbent and inhalant veſſels, at which time I enjoined the ſpareſt mode of living. Afterwards, I gave bark and ſtimulants, and ordered a generous and plentiful diet, and my patient inhaled 900 cubic inches of air, ſuper-oxygenated by 2 quarts of vital air. By this alteration (to the propriety of which meaſure the Brunonians, or rather the diſciples of yourſelf and Dr. Darwin will readily aſſent) my patient was quickly reſtored to health, as the above letter teſtifies. But how far the ſuper-oxygenated air concurred in this cure, comparative trials muſt determine.

Extract of a Letter from DR. THORNTON, *On Hydrocephalus.*

November 15, 1795.

THOMAS MEAD, a lad, 13 years of age, was ſix weeks in St. Thomas's Hoſpital, under the care of Dr. Fordyce. We cannot doubt an inſtant, but that every proper remedy had been tried before he was diſcharged thence *incurable.* Being blind, he next came under the care of my friends, Meſſrs. Wathen and Phipps, who with real love for the improvement of medical ſcience, and a wiſh to leſſen the miſeries of ſuffering humanity, ſent him to me, as a fit object for the trial of the pneumatic remedy. The pupils of the eye were greatly dilated, the pulſe was ſluggiſh, and he had fits, which were unlike thoſe of epilepſy or hyſteria, and uſually occurred, at uncertain periods, once or twice a week. Theſe ſymptoms we know denote water in the head. He inhaled the vital air in the doſe of two quarts to thirty-ſix of common air, and in three days he began to diſtinguiſh objects. He then underwent a courſe of mercury, took bark and bitters, and inhaled the ſuper-oxygenated air. His ſight daily became ſenſibly clearer, the pupils of the eye were leſs dilated, and he had no recurrence of his fits. His pulſe was increaſed in quantity and vigour. But during theſe favourable ſigns, the weather ſet in extremely bad, and the lad living at a diſtance from me in the country, he left off attending for ſome days, and all medicines were in conſequence omitted. When the weather became better, in his attempt to viſit me, he had a fit on the road, which kept him back a day or two longer, and when I at laſt ſaw him, he complained much of great weight and pain at his forehead; he appeared ſtupid, and had gradually fallen off in his ſight. I began to be very apprehenſive for his ſafety, and cautioned the mother to bring the boy regularly each day. The fits, however, recurred, at firſt once, and then twice a day, with increaſed violence, and the benefits that were kept up during the laſt five weeks were now alas, loſt for ever.

Obſervations on this Caſe.

Did not the recovery of ſight in three days during the inhalation of ſuper-oxygenated air ariſe from the power of this elaſtic fluid? and does it not indicate, that it will be of ſervice in this fatal diſeaſe? might not the dropping of ſo powerful an excitement as the combined operation of exerciſe, bark, mercury and a ſuper-oxygenated air occaſion what Dr. Cullen calls the "collapſe" of the ſyſtem, and in ſome meaſure account for the failure in this trial? or might not the ſuper-oxygenated air, without mercury, conjoined with bark have proved ſucceſsful? Theſe intereſting points, more extenſive experience will, I truſt, clear up.

Your's ever,

R. I. THORNTON.

Letter from DR. REDFEARN.

Lynn, Norfolk, 26th *June,* 1795.

SIR,

I SEND you the caſe of Hæmoptyſis which I mentioned in my laſt letter: you will no doubt think it an important one.

I am, Sir, your moſt obedient Servant,

RICHARD REDFEARN.

To Dr. Beddoes.

Mr. B. F. Æt. 23, of a florid complexion narrow cheſt, prominent ſhoulders, ſmooth ſkin, and of a delicate ſlender form, has been afflicted with hæmoptyſis about two years and a half; attended with dyſpnœa, cough, a diſagreeable ſenſe of burning in the cheſt, and expectoration of a purulent nature. P. about 100, and invariably accelerated by the hdc. air---Hectic fever was not completely formed; but he had at times a ſenſe of chillineſs in the day time with heat towards the evening. He began by taking one quart of hydro-carbonate, diluted with twenty-one quarts of atmoſpheric air, once a day. From this mixture he experienced much vertigo during its inhalation, and, two hours after dinner, he ſuddenly became vertiginous, from which, however he ſoon recovered, although a violent head-ache remained during the reſt of the evening.

The following days he only inhaled one pint of hydro-carbonate, mixed with twenty quarts of common air, once a day, which generally affected him with ſome ſlight vertigo and tightneſs over his forehead; the hydro-carbonate was increaſed gradually to two quarts or more at one doſe, but I find it always neceſſary to begin with the original doſe, where the air has been recently generated.

My patient has been perſevering in this plan about three months; and has had no return of hæmorrhage; his cough and expectoration are very much diminiſhed; ſometimes he does not expectorate more than one table ſpoonful in the ſpace of three days; he has alſo never experienced any of the diſtreſſing heats in his cheſt which haraſſed him before the adminiſtration of the air; his dyſpnœa is perfectly removed, he can ride upon horſeback twelve miles without feeling much fatigue; his appetite is very good and he ſleeps well: P. 80, he ſays he thinks his health is perfectly eſtabliſhed.

* * *

Extracts of letters from DR. ALDERSON, *respecting a case of Chlorosis, a case of Pulmonic Disease, and a cheap Apparatus for the production of elastic fluids.*

Hull, *May* 29, 1795.

DEAR SIR,

I HAVE had under my care a caſe of apparently approaching phthiſis; the complexion was uncommonly florid; the patient has perfectly recovered from the long-continued uſe of hydrogen air.

A caſe of chloroſis has alſo occurred to me in which ſteel proved ineffectual without oxygen. The patient never could ſleep without her doſe of this air, of which ſhe inhaled a quart every night. So great were the beating of the carotids, the anxiety and the ſenſe of drowning, when ſhe was about to lie down, that ſhe was under the neceſſity of ſitting up all night, nothing ever procuring reſt, till the oxygen was adminiſtered. Then the beatings ceaſed. She lay down and reſted. She continued the air ſome months. It was aſſiſted by ſmall doſes of ſteel, which ſhe had in vain tried under every formula before. She has ever ſince been healthy and blooming.

I uſe the ſimpleſt contrivance poſſible for every kind of air. I will ſend you a drawing of it, if you think it will be of any ſervice.

I am your's moſt ſincerely,

J. ALDERSON,

June 26, 1795.

DEAR SIR,

MY friend Mr. Mead, who invented the apparatus of which I have now ſent you a drawing, and which I have conſtantly employed, being much engaged in a very intereſting pneumatic purſuit, I have neceſſarily been obliged to poſtpone to this time my promiſed account of the caſes in which I have ſucceſsfully employed factitious airs.

I was ſome time ago called to meet Dr. B. in the caſe of Miſs L. aged 17, who had been long labouring under chloroſis. As my colleague had been for ſome time adminiſtering a variety of very proper tonics, and being at that time perſuaded that ſome preparation of ſteel would effect a cure, I adviſed only a different preparation of that mineral, but the change not producing the deſired effect, the Doctor ordered ſome blood to be drawn from the arm, in the hopes that after the evacuation the tonics would have a better effect.—The blood was remarkably pale, and afforded but very little craſſamentum indeed; no alteration took place in the ſyſtem for the better, ſhe then went to ſea, and returned from her voyage ſomewhat better, but ſoon after relapſed, and the complaint being now attended with great emaciation, and an uncommon throbbing in the carotids, which upon lying down was ſo very troubleſome as to prevent her ſleeping, my aſſiſtance was again called for in 1793, and having no prejudices to overcome with her very ingenious father, I immediately propoſed the inhalation of oxygen gas, the firſt effect of which was to take off the throbbing of the arteries, enabling her to lie down and to get quiet ſleep, the other effects are conciſely related by her father, in his letter to me, of which the encloſed is a copy.

She inhaled every night, by means of the funnel, a quart of oxygen, unmixed with any other air, which was ſometimes prepared from nitre, and ſometimes from manganeſe by heat.

Note. It may not be amiſs to remark, that no air from nitre ought to be kept for uſe that comes over before the reotrt be perfectly luminous, and even then ſome azotic gas will aſcend owing I ſuppoſe to the breaking down of a chryſtal, the center of which has not been thoroughly permeated by the light.

I. A.

To Dr. Beddoes.

* * *

Letter from MR. LAMBERT, *to* Dr. ALDERSON.

IT is not neceſſary, Sir, that I ſhould attempt to deſcribe to you the nature of my daughter Elizabeth's complaint or to enumerate the various medicines that had been adminiſtered, prior to your ordering the *pure air.* The immediate effect produced by this, was a conſiderable exhileration of her ſpirits: in a few days the violent beating in her head greatly abated—the ends of her fingers began to aſſume their natural colour; and by a ſteady perſeverance in the uſe of it for about two or three months together, with the uſe of ſalt of ſteel, from a ſtate of the greateſt debility, and an appearance the moſt unhealthy, ſhe aſſumed her former colour, ſtrength and vigor. With the deepeſt ſenſe of my great obligation to you,

I remain, Sir,

Your very humble Servant,

G. LAMBERT.

Hull, June 5, 1795.

Extract of a Letter from DR. ALDERSON.

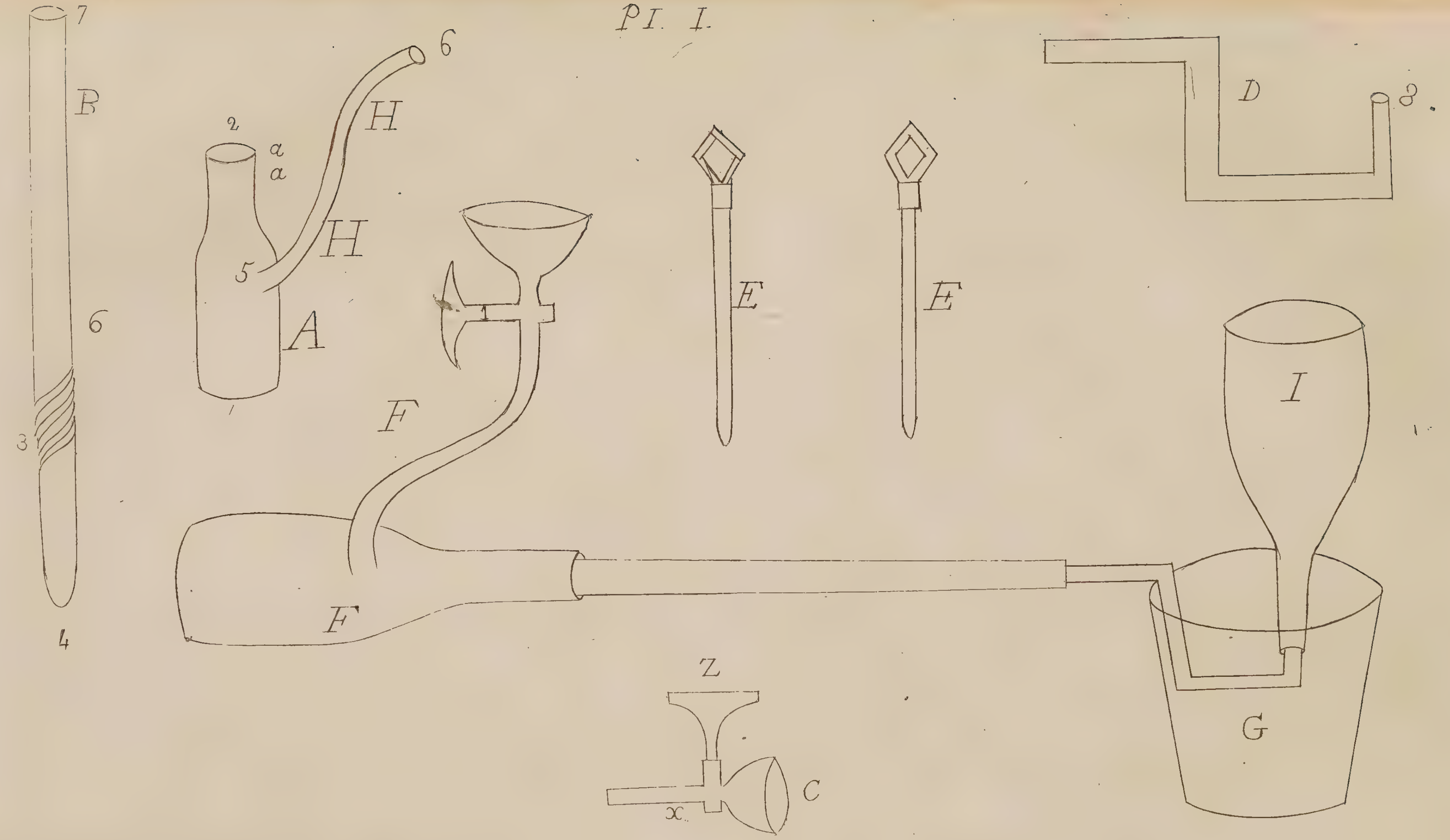
1793.—MISS —— aged 16, had all the ſymptoms of approaching phthiſis, cold tremors about twelve o'clock, fever, heat, and fluſhing every afternoon, pulſe 120, countenance uncommonly florid, breathing rather difficult, cough ſevere, accompanied with ſome expectoration; as ſeveral of her family had died of conſumption, there could be little doubt of the tendency of theſe ſymptoms, and after finding nitre, ſpermaceti, vomits, &c. to have no effect, I adviſed the inhalation of hydrogen; ſhe daily inhaled a quart of pure hydrogen from water, by every now and then taking an inſpiration at the mouth-piece of the tunnel. It frequently oocaſioned nauſea, and even vomiting, but this, I ſuſpect, was occaſioned by her every now and then ſwallowing a portion of it into the ſtomach. The pulſe fell, the fluſhings and fever ſubſided, and the whole train of phthiſical ſymptoms left her, but at the expence of her fine florid colour, her countenance having ever ſince been of a darker tint than before ſhe was ill.

I. A.

To Dr. Beddoes.

June 5, 1795.

Pl. I.



DESCRIPTION of a PNEUMATIC APPARATUS.

PLATE I. A. An iron retort or tube cloſed at end (1) open at end (2) with a female ſcrew to receive the male ſcrew of the tube or gun-barrel B. at the fig. 3. the poſition of the ſcrew (3) muſt be ſuch, that the end (4) may be three inches above the bottom (1).

H. A bent iron tube inſerted into A. at (5) which receives the cup with the cock C. at the point (6).

D. A crooked tube inſerted into the gun-barrel at the point (7).

E. E. Screw-keys or wrenches, the one fitting A. at *a.* the other B. at *b.*

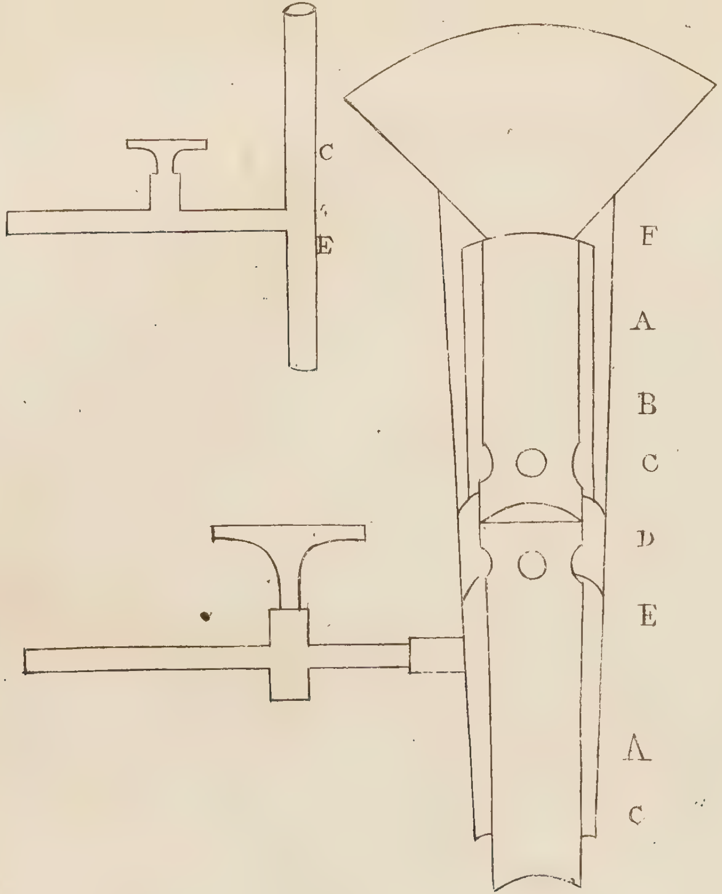
To uſe the veſſel, fill A. with the ſubſtance neceſſary to produce the ſpecies of air required, to a height, three inches from the bottom; put the apparatus together, uſing a little lute, or flour and water, at the ſeveral joints: inſert A. between the bars of a common grate, to the dotted line F. F. F. and D. into a pail filled with water, as in fig. *f.* When A. has acquired a red heat, if water be neceſſary to the production of the air, fill the cup C. with water, turn the cock Z. into ſuch a poſition that the water may gently *drop* through the tube X. Inſert the tube X. with lute, into the tube H. at the point (6) fill a bottle with water and inſert it over the end (8) of the tube D. on the pail G. filled with water.—Note. When the water is not to be uſed ſhut the cock Z.

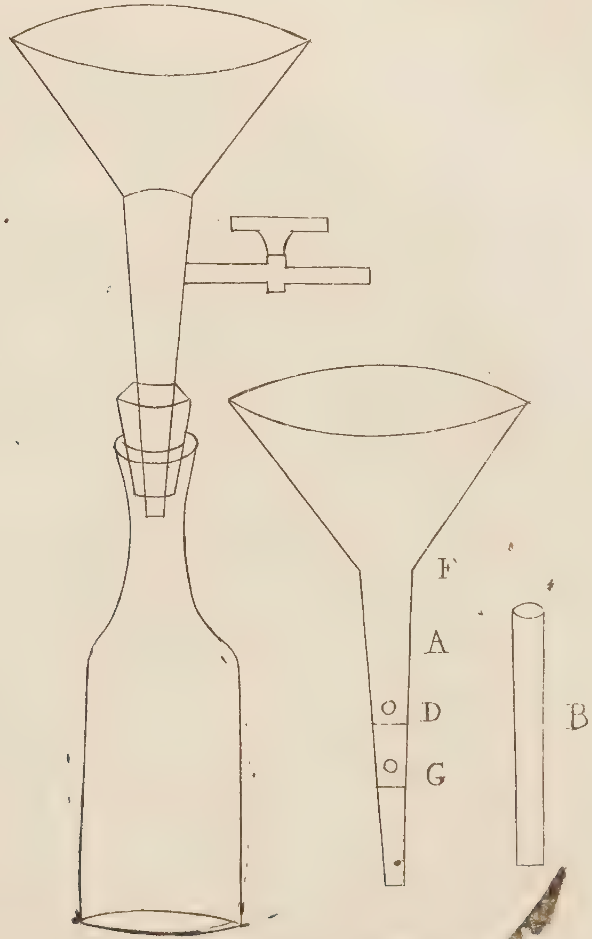
EXPLANATION of PLATE II.

A. A funnel with its pipe or tube ſtopped at D. and perforated above and below with two or three ſmall holes; round the tube A. is ſoldered the tube B. left open at top, the tube C. is made to circumſcribe the tube B. and to be ſoldered to the funnel at *f*. and likewiſe ſoldered at *g*.

When water is poured into the funnel and the cork inſerted into a bottle filled with gas, the water deſcends through the tube A. till it arrives at the diviſion or ſection D. it then flows through the ſmall holes at *a*. and aſcends between the tubes A. and B. flows over the top of B. and deſcends again between the tubes B. and C. till it arrives at *g*. (where it regains the tube through an opening above *g*.) and thence into the bottle: as the water goes in the air eſcapes between the tubes A. and C. through the cock into the mouth-piece; the lower end of C. is made to perforate a cork which is properly attached to it, and which ſecures it air-tight into the neck of a common bottle.

The whole apparatus may be made for leſs than a guinea, and may be introduced to the bedſide of the patient if neceſſary, for I have had a caſk filled inſtead of a bottle, and placed upon a chair; by turning the cock, the patient may take an inſpiration whenever he pleaſes, the cock being thruſt into the ſpiggot-hole.


C
E
F
A
B
C
D
E
A
C


F
A
D
G
B

Extract of a Letter from DR. THORNTON,

On a Case of Venereal Affection.

May 3, 1795.

THE practitioner now and then meets with peculiar habits, in which mercury ſeems to have no action :—and again, other caſes in which mercury is immediately carried off by ptyaliſm, violent ſweats, or exceſſive diarrhœa. In both theſe ſtates I was deſirous to ſee the vital air tried, but as yet have been able only to obſerve its ſalutary effects in the latter inſtance.

A wealthy merchant of the city of London, after inebriation, became the victim of indiſcreet indulgence. Mercury was had recourſe to in the form of pills and unguent, but theſe produced the greateſt derangement in his health, and affected almoſt inſtantly the ſalivary glands. The primary ſymptoms being however ſubdued, his ſurgeon, an able and experienced practitioner, thought fit to leave off the mercury, ſeeing it was ſo inimical to his conſtitution; and for ſome time the patient believed himſelf ſafe; but this Proteus diſeaſe broke out in another form, and that unfortunately at the time when he had juſt married. He was ſalivated again, but could not retain, according to the opinion of Bell, ſufficient mercury to eſtabliſh a cure; or rather the mercurial action was at firſt too violent and local to be kept up a ſufficient time to produce a permanent benefit. Hence this cruel diſorder afflicted him for more than the ſpace of two years. When I ſaw him, the ſurface of his body was deformed by dreadful blotches; he had an ulcer on the lungs, attended with a hard cough, and bloody and purulent expectoration;

with other horrid marks of this dreadful ſcourge of illicit deſires. Meſſrs. Wathen and Phipps, ſeeing this gentleman in ſo deplorable a ſtate, and having witneſſed the relief, ariſing from the aerial practice, in the caſe of a ſervant maid, whom (though not a ſervant of their family) they humanely lodged in their houſe, and who was in the laſt ſtage of a pulmonary conſumption; adviſed him by all means both to conſult me and Mr. Hill.

From my former reſidence at the Hotwells, near Briſtol, and from frequent converſation with the late Dr. Rigg, Phyſician of that place, I was convinced of the fatality of conſumption from venereal ulcers; and though this caſe was not exactly the one I had chalked out in my mind for the firſt trial of the vital air, yet, as perhaps it afforded the only chance of recovery, I urged its uſe. Mr. Hill accordingly gave him each day the ſuper-oxygenated air, in the proportion of two quarts to a thouſand cubic inches of atmoſpheric air; and by way of medicine, he had muriated mercury in the ſtrongeſt decoction of bark, with the cortex, and two grains of opium at night. He was alſo occaſionally purged. By this courſe without any violent effect from the mercury, he was in three weeks clear of all defœdations of the ſkin, and in a month the ulcer on the lungs was healed, and the other marks of venereal affection diſappeared, and in ſix weeks he went to Margate, deeming himſelf perfectly cured.

A queſtion here naturally ariſes, whether the cure in this caſe proceeded from a different adminiſtration of mercury? or from the combined operation of ſuper-oxygenated air? theſe doubts muſt often occur to a private practitioner before the acquiſition of more facts.

I cannot conclude this letter without congratulating you on the diſcovery that the kali ſulphuratum ſtops the action of mercury on the ſyſtem, in a few hours arreſting ſalivation.

Extract of a Letter from DR. THORNTON,

On a White Swelling.

July 5, 1795.

CAPTAIN ——— of the Devonſhire Militia, was under the care of ſeveral ſurgeons, for a white ſwelling of the knee, which, as is uſual, increaſed, notwithſtanding the means employed. Mr. Baſtard, Member for that county, adviſed him to place himſelf under Mr. Hill. After having inhaled the ſuper-oxygenated air but a fortnight, and taken a mixture of bark, myrrh, and columbo, his health was reſtored and invigorated; the ſwelling had gradually decreaſed; he could move his limbs without pain or lameneſs; and in three weeks he was perfectly cured.

Ever your's,

R. I. THORNTON.

Extract of a Letter from DR. THORNTON,

On a Case of Cancer attended with Dyspnœa.

BEING requeſted to attend with Mr. Hill in a caſe of cancer by my friend Mr. Wathen, I had the pleaſure to hear the latter gentleman daily pronounce, that from the inhalation of the ſuper-oxygenated air, the open wound had put on a more favourable appearance, and the diſcharge was more kindly. The health of this Lady was alſo much mended, and what is remarkable, and can only be aſcribed to the effect of the ſuper-oxygenated air, and the moſt benign of all tonic powers, Hope, though for the laſt fifteen years, ſhe had been obliged to have recourſe to opening pills, her body now had its regular exoneration, without the aid of medicine. But the knotty tumours about the head and neck ſeemed rapidly to haſten in their progreſs towards an ulcerous ſtate, and the vital air was in conſequence deſiſted from, and the patient left, alas! to languiſh in a diſeaſe, that, till of late, admitted of neither palliative or cure.

The cancerous caſe, the object of the preſent letter, occurred not long after: it was complicated with another malady, hitherto deemed incurable, and one almoſt equally afflicting. The cancer in this Lady was very large, and the whole of the left breaſt projected, and purſed in. It was exceedingly painful, and attended with violent dyſpnœa; ſhe could obtain little or no ſleep, and therefore ſcarce any reſpite from miſery.—From my experience, as related above, I doubt whether I ſhould have adviſed the vital air, had not Dr. Ewart candidly communicated the reſult of his trials with fixed air in open cancer, and had I not myſelf ſeen a man whoſe finger was taken off by Mr. Hill, receive immediate relief from pain by plunging his hand in that ſpecies of gas. This caſe will be more clearly underſtood by the peruſal of the encloſed letter, which I received from her ſon three weeks after Mrs. Barker had inhaled the ſuper-oxygenated air, which was adminiſtered in the proportion of two quarts of vital air, to fifteen hundred cubic inches of common air.

Silver Hall, Iſleworth, Jan. 12, 1795.

DEAR SIR,

I SHOULD be very much wanting in gratitude, did I not expreſs to you the very great obligation I feel myſelf under for the benefit my mother has received during the ſhort time ſhe has been under the care of the ſurgeon, whom you recommended. Some months previous to her attendance on Mr. Hill, ſhe had had the advice of one of the firſt phyſicians in town, but ſo far from receiving benefit from his preſcriptions, they ſeemed to aggravate her complaint. You may therefore gueſs my ſatisfaction on obſerving the very great alteration produced for the better, by means of the vital air. Before, ſhe was in violent and almoſt continual pain; ſo much ſo, that ſhe could have no reſt at night; all that pain is entirely removed, and ſhe now ſleeps as ſound as ever. Before, her ſtomach loathed the moſt innocent food; now ſhe eats indifferently of any thing, and that with pleaſure and ſatisfaction to herſelf. Her great difficulty in breathing, which more peculiarly oppreſſed her at night is wholly removed, for ſhe now breathes with the utmoſt eaſe and freedom. Indeed the alteration is truly extraordinary, and when it is conſidered, that this change has been effected in leſs than three weeks, and during weather unuſually ſevere, alſo on a perſon approaching 70 years of age, whoſe health had been long on the decline, it muſt be looked upon as the more wonderful. I make not the leaſt doubt, but that ſo powerful an agent, as the vital air, will be productive of the greateſt good to her, as well as many others. With the ſincereſt acknowledgments for the benefit ſhe has already received and many ſincere wiſhes of future ſucceſs,

I have the honour to be, Dear Sir,

Your very obliged humble Servant,

GEORGE BARKER.

The reſult of this caſe I ſhall hope to communicate with other trials in cancer very ſoon.

Ever your's,

R. I. THORNTON,

To Dr. Beddoes.

Obſervation.

This Lady was ordered the decoction of bark, but having a great averſion to medicine, ſhe did not take it regularly, and little, I think, can be aſcribed to this remedy, at leaſt no effect equal to that deſcribed in the letter.

Extract of a Letter from MRS. BARRETT.

July 12, *Queen-Square, Weſtminſter.*

SIR,

MY aſthma had afflicted me three years. It attacked me very violently at times, the fit going off generally with expectoration, leaving me very low and weak.— The laſt winter it was uncommonly ſevere, and, latterly, for months, I had not known what it was to enjoy a comfortable night's reſt. As a tradeſman in our neighbourhood had been juſt cured by medicated air of an aſthma of thirteen years ſtanding, I reſolved to put myſelf under Dr. Thornton's care, though before this, I had made up my mind to try no more medicines.— I inhaled the vital air from a large bell glaſs, and its effect was ſo immediate, that on the ſecond night I ſlept the whole night through. My attacks were now leſs frequent, and milder, and purſuing the vital air for ſix weeks, I got free of my complaint. With the bleſſing of God, I have continued ſince in perfect health, except I catch a bad cold, when my aſthma recurs, but in a very ſlight degree.

I am, Sir,

Your obedient humble Servant,

ELIZ. BARRETT.

To Dr. Beddoes.

Obſervations on this Caſe, by DR. THORNTON.

1. THIS caſe bears a great reſemblance to the caſe of the Rev. Dr. ——, which is recorded by Mr. Townſend, in his Guide to Health, and the indications being the ſame, the ſame plan of cure was purſued. The air this Lady inhaled, was two quarts of vital air to 1500 pints of common air.

2. It was remarkable at firſt, how long a time ſhe took to conſume this quantity of air. As her complexion, which was at firſt livid, began to clear, I remarked, ſhe conſumed the air much faſter.

3. The tradeſman, whom Mrs. Barrett mentions in her letter, is a baker. He certainly obtained conſiderable benefit, and when I ſent on the 20th of July, 1795, to inquire how he continued, the anſwer returned was, "that he had not enjoyed ſuch health, as at preſent, for years."

* * *

A Letter from the Rev. JOS. TOWNSEND.

Pewsey, July 21, 1795.

DEAR SIR,

WHEN I was in town, Dec. 15, I called on Mr. Hill, and finding him engaged with patients, I went into the parlour, where I met with Mr. Atwood. We ſoon entered into converſation, when he communicated his apprehenſions of loſing his leg, and aſked me if I believed that the vital air could effect any thing in ſuch a caſe. Finding this Gentleman deſirous of having my opinion, I explained to him, that though ſpirituous and other ſtimulating applications might call forth for a time, the action of a part, in which the vital energy was much diminiſhed; yet, as exhauſting it without producing action ſufficient for a cure, a proportionable debility and tendency to gangrene muſt enſue.

This, Sir, ſaid he, is exactly my caſe. After every application, exciting pain, black parts have conſtantly appeared, which were either taken away by the knife, or elſe ſloughed off.

It is ſo, ſaid I, with *spontaneous* mortification: it is preceded, in weak habits, by inflammation accompanied by a proportionate loſs of power. But when the air is rendered by the chemiſt more replete with that ſubſtance, which is eſſential to vitality and is inhaled by the lungs, this alters the diſpoſition of the ſyſtem, and produces what has been called the phlogiſtic diatheſis, whereby the exhalent arteries pour forth inſtead of ſerum, coagulable lymph; the abſorbents carry away diſeaſed parts; and the lymph being rendered more tenacious, is converted into granulations. In the new mode of treatment with vital air, energetic action in the part is ſupported by the ſyſtem: in the old practice it is kept up for a ſhort time only, by partial ſtimuli on weak and diſeaſed veſſels. There it is produced with a change of the blood; here it deprives the blood of life: there it produces energy; here it excites irritation: there it aids the efforts of nature, and renders them effectual; here it calls her into action, which ſhe is unable to ſupport.

This reaſoning ſeemed to have weight with him, and here our converſation was interrupted by a meſſage from Mr. Hill, that he was ready to attend his patient. However I begged permiſſion of Mr. Atwood to ſee his wounds, which emitted a very offenſive fœtor, and had diſcoloured his ſtocking. But no ſooner were the applications taken off than the fœtor became intolerable, and the ſight ſo diſguſting, that I was conſtrained to haſten into the open air.

On my return to London, Jan. 15, I was impatient to know what had been the iſſue, and gave Mr. Atwood the meeting as before at Mr. Hill's. The leſſer of the wounds was healed, and bore the friction of a bruſh. The larger wound, ſo well deſcribed by Mr. Corp, was filled and covered with ſkin, excepting one place the ſize of my nail, which he told me was occaſioned by ſome accident.

I was equally pleaſed this day with having a ſight of Patterſon, whoſe caſe I had heard related at Wathen and Phipps's in Pall Mall, and have ſince ſeen deſcribed by Dr. Thornton. His leg, now healed, ſhewed what had been the extent of his former ulcer; his face was clear, and when I put a little bit of paper on the ground, he ſaw well enough to go and pick it up. As I examined his eye, I diſcovered ſtill ſome degree of opacity in the cryſtalline lens.

To demonſtrate, that the inſpiration of vital air increaſes heat, I ſhall trouble you with one fact, from a caſe of melancholia, communicated to me by Dr. Thornton, for the ſecond volume of my Guide to Health.

Mr. Windy, from being hypochondriacal, became perfectly inſane. He was gloomy, ſullen, and ſilent, or muttered only expreſſions, which evinced what were the terrors of his diſturbed imagination. He had no recollection of his wife or children, and the only notice he took of his attendants, was to manifeſt ſuſpicion that they meant to injure him. He made ſeveral attempts to deſtroy himſelf. He was coſtive, and had remarkable coldneſs of the extremities.

As Dr. Thornton had ſucceeded ſo well with the vital air, in the caſe of Mr. Ruſſel, deſcribed in the firſt volume of my Guide to Health, printed for Johnſon, in St. Paul's Church-yard, and Robinſon, Paternoſter-row, he determined to give it a fair trial in the preſent inſtance. He began therefore with giving four quarts of vital air to ten quarts of common air, which produced no change.—He then gave ether and brandy, hoping thereby to increaſe the vital heat, but without the leaſt effect, for his hands continued cold as clay.—Thus diſappointed in his firſt efforts to relieve his patient, he gave an emetic in the evening, which brought up a vaſt quantity of viſcid mucus. At bedtime he ordered a calomel pill, which was worked off in the morning with rhubarb and ſal polychreſt. Having thus cleanſed the alimentary canal, he gave the day following ether and brandy as before, and cauſed his patient to inhale the ſame quantity of vital air, which inſtantly produced a genial warmth extending to his fingers ends. Nor was this a tranſitory effect, for it continued all the time he was under the care of Dr. Thornton.

For the ſequel of this caſe I ſhall refer you to the ſecond volume of my work, which I ſhall before Chriſtmas have the pleaſure to preſent to you, and in which for the benefit of ſtudents I ſhall illuſtrate and explain this wonderful phœnomenon.

I am authorized to ſay, that Mr. Atwood inhaled upon an average each day, two quarts of vital air, to 400 quarts of atmoſpheric air, and that Patterſon inhaled two quarts of vital air to ſixty of atmoſpheric.

I am, dear Sir,
Your Friend and Servant,
JOSEPH TOWNSEND.

To Dr. Beddoes.

* * *

Letter from Mr. DANBY, *to* Dr. BEDDOES.

Upper John-ſtreet, July 19, 1795.

SIR,

I HAD the honour of receiving your letter, in which you requeſt my caſe, and an account of the effects that the vital air had on me. I have accordingly drawn up the narrative which I encloſe.

I went the latter end of July, 1794, in tolerable health to ———. Not deſigning to ſtay there long, I took up my abode at an inn in the town. As was my cuſtom at theſe places, I ordered port wine after dinner and ſupper; I obſerved the wine had a peculiar ſweet and ſoft flavour, which was very unuſual and agreeable, but I by no means drank of it to exceſs.—On the third day after my arrival I was ſeized with tremors, and having taken up a pen to write out ſome muſic, to my great alarm, I found I could not accompliſh it. The friend who was with me, complained at the ſame time of a moſt violent bowel complaint, with great griping and copious evacuations. I was ſoon after ſeized with ſpaſms, and loſt the uſe of both hands and feet. I proceeded on to Lymington, and having conſulted a phyſician there, was ordered bark and ſea bathing. I went then to the Iſle of Wight, and attempted to bathe once, and immediately perceived a great increaſe of my diſeaſe. I therefore haſtened back to town, and as ſoon as Dr. Rowley heard that I was in a moſt deplorable ſtate, with that humanity ſo conſpicuous in his diſpoſition and character, he voluntarily came to offer me his ſervices, and with the greateſt kindneſs viſited me both in town and country. But notwithſtanding thoſe remedies, which I have not the ſmalleſt doubt were the moſt promiſing of the pharmacopœia, yet my diſorder kept on advancing, and as I had been taking drugs for five months without benefit, I grew very anxious to make trial of the vital air, which had been of the greateſt ſervice to ſome of my friends. But I did not chooſe to enter into any new ſcheme, without firſt conſulting my friend Dr. Rowley, who ſo far from objecting to it, wiſhed me by all means to make trial of the vital air. I waited therefore upon Dr. Thornton. It was the beginning of December. My hands were pendulous, ſo that I was obliged to be fed, dreſſed, and undreſſed, like a child; being quite helpleſs, having no uſe of my limbs, I was alſo obliged to be carried from place to place; my countenance, as well as I can expreſs it, was of a black yellow; my appetite gone; and my nights truly dreadful. Counting the hours as they paſſed, I repeatedly prayed for morning, which was no ſooner come, than I hurried from my place, as I called it, of torment. You will ſcarce credit the aſſertion. A week had not paſſed from the time of my firſt inhaling the vital air, before my appetite returned, and my nights were rendered ſo comfortable and refreſhing, that my wife could ſcarce get me up at a reaſonable hour in the morning—bed was become ſuch an indulgence! my ſpirits, as you might expect, were very great; my appetite the ſame; and my family obſerved that my countenance was conſiderably mended. Before the month was out, the motion of my hands was ſo far reſtored, that I could compoſe catches and glees, and in ſix weeks I began to employ my crutches. My general health is at the preſent time fully eſtabliſhed, and Dr. Rowley ſays, "I ail nothing now but weakneſs, the conſequence of previous indiſpoſition."

I have the honour to be, Sir,
With the higheſt reſpect,
Your obedient humble Servant,
JOHN DANBY.

Obſervations on this Case, by Dr. THORNTON.

1. DID not this paralyſis ariſe from the poiſon of ſugar of lead? An acquaintance of Mr. Danby, who went *since* to the ſame inn, was ſeized with ſimilar ſymptoms. Several medical men, who had no knowledge of the ſtory, have aſked him, "whether his phyſicians did not think he had been poiſoned by lead?"

2. If this was truly the caſe, what would be the probable effect of ſea-bathing? Dr. Johnſon, a young phyſician of riſing reputation, when at Cambridge, took a dog and poiſoned him with ſugar of lead; he was affected with paralyſis. He opened the window and door, and admitted a current of cold air, when the paralyſis became *more violent*, and the animal ſoon expired.

3. Dr. Rowley had tried tonic medicines, as bark, ſteel, and bitters, in various forms; and afterwards mercury as an alterative, with the intention, as I ſuppoſe, of giving irritability to the ſyſtem. What might have been the effect of a conjunction of the two means?

4. Or was it neceſſary to oxygenate by the lungs, the organ ſuppoſed by ſome ſolely appropriated in cold climates to that purpoſe? (vide Medical Extracts, page 106). I have ſome grounds for ſuſpecting this, for I left off the ſuper-oxygenated air, and gave in the room of it, nitre and acids, but it produced ſo great a derangement in Mr. D.'s conſtitution, that it was obliged to be deſiſted from, and I muſt obſerve, that the mercury by itſelf, though indicated, ſeemed to aggravate the diſeaſe.

5. This

5. This caſe affords a very ſtriking inſtance of the different effects of modified air of different degrees.— When Mr. Danby inhaled as a doſe, two quarts of modified air to 800 pints of atmoſpheric air, he generally afterwards experienced a comfortable glow, which extended, as he himſelf uſed to expreſs it, to his fingers' ends. But when I attempted three different times to augment the doſe to three quarts of vital air to ſixty pints of atmoſpheric air, he was, after inhaling it, ſeized each time with excruciating and wandering pains, and paſſed a feveriſh night, and I was obliged to return to the former doſe, and I muſt obſerve he always ſaw me prepare the mixture of airs, from the beginning to the end of his attendance on me. The medicines I preſcribed were bark with other tonic powers; and coſtiveneſs was obviated by thoſe cathartics in which the acid or oxygenous principle predominates.

Extract of a Letter from Mr. WATT, *Engineer, to* Dr. THORNTON.

Heathfield, Birmingham, July 13, 1795.

DEAR SIR,

I AGREE perfectly with you, that the artificial air ſhould be given much diluted with common air, and whether that has been yet carried *far enough* does not appear certain to me. I was convinced of the advantage of dilution from experiment, as well as from reaſoning a priori; for if a man breathes any mixture containing much oxygene, he will expire the air highly oxygenated, therefore the oxygene has not been abſorbed, and could only act by its immediate ſtimulus, and not by affecting the blood materially, whereas had the ſame quantity of oxygene been diluted with more common air, it would have been longer in being breathed, and would have had more time to act upon the lungs and be abſorbed. The ſame is the caſe with hydro-carbonate, if taken little diluted, the greateſt part is expired without having had any action, but by dilution time is given, and there is a continued action upon the blood, which though leſs violent in its immediate effects, laſts longer and ſeems more friendly. All this leads to the concluſion, that when theſe airs are breathed, the patient ſhould retain them in his lungs a a longer time than uſual; and it is probable alſo, that by deep inſpirations many of the ſmall veſicles of the lungs may become diſtended, which do not commonly expand, and may retain the factitious airs for abſorption; hence the frequent return of vertigo after inhaling the hydro-carbonate by forced inſpirations.—— Your experiments ſeem to confirm, what I have been ſaying.

You will ſee from all this, that I highly approve of your mode of proceeding, by conſiderable dilution of the airs: and by fair and minute repreſentations of ſymptoms, doſes, and facts, to which if it were convenient to add your obſervations on the circumſtances of the preparations of the air, it would ſtill further the ſcience.

Heartily wiſhing every ſucceſs to your endeavours for the benefit of mankind,

I remain reſpectfully, &c.

JAMES WATT.

Observation by Dr. THORNTON.

IS not this reaſoning conſiderably in favour of a Pneumatic Inſtitution, in which the vital, hydro-carbonate, hydrogene, fixed, and other airs, will undergo a very great dilution, and be longer inſpired ? this remark will be ſtrengthened when I come to a caſe of pleuriſy, in which I made experience of the effects of a reduced atmoſphere.

In a letter dated July 23d, 1795, Dr. Thornton obſerves, " that the lungs of a frog are really two bags : " therefore little oxygene is abſorbed. The more " lungs are honey-combed or divided into partitions, " the larger ſurface do they afford, for the abſorption " of oxygene. In broken-winded horſes, as I know " from diſſection, five or ſix cells run into one. The " lungs in this inſtance bear a greater reſemblance to " thoſe of the turtle, than in horſes not broken " winded."

Letter from Mr. WATT.

Birmingham, June 24, 1795.

DEAR SIR,

I AM glad to hear that you propoſe ſoon to publiſh an appendix or ſupplement to the ſecond edition of your CONSIDERATIONS. If you approve of the following cautions, as I think you will, I beg that you will inſert them, although they are moſtly a repetition of what has been already printed, but too little attended to by ſome uſers of the pneumatic apparatus.

1. OXYGENE AIR is ſubject to be debaſed with fixed air, if any inflammable matter be mixed with the manganeſe from which it is procured, (which may frequently happen by accident), or when it is prepared in a new fire-tube, or one in which hydro-carbonate has been prepared; in all theſe caſes, the quantity of oxygene air produced, will be much leſs than would otherwiſe be yielded by the ſame quantity of manganeſe.— This ſpecies of air when freſh made, alſo contains a large quantity of manganeſe in a ſtate of ſuſpenſion, which it depoſits upon being kept ſome hours at reſt.

It has been found by ſeveral patients, that the freſh-made air containing the ſuſpended manganeſe occaſions a diſagreable ſickneſs, and that which contains much fixed air, occaſions ſickneſs and pains in the breaſt, which do not entirely ſubſide for ſome days, though they do not ſeem to be of a malignant nature.

I ſuſpect therefore that ſome unpleaſant effects which have been imputed to oxygene air, may have been owing to one or both of theſe cauſes; and therefore recommend, that in preparing this air, there ſhould always be ſome cauſtic lime well mixed in the water of the refrigeratory, and kept ſuſpended by a gentle motion of the agitator, and that when the air is procured it ſhould be well ſhaken with ſome quick lime and water in the air holder, in which it ſhould be kept twelve hours before it is uſed, ſhaking it well from time to time. To theſe add the precaution of appropriating a fire-tube ſolely to the preparation of oxygene, and it will be attained free from any noxious admixture.

HYDRO-CARBONATE AIR is alſo ſubject to an admixture of fixed air, which from the relations of intelligent practitioners, ſeems to diminiſh its efficacy, and may not in many caſes be proper to be adminiſtered where hydro-carbonate is uſeful. I am aſſured by Mr. Barr, that to procure this air (hydro-carbonate) of a good quality, the water ſhould be admitted ſo ſlowly, that it may require twenty minutes to procure one full of the large bellows, and that when longer time was employed, in conſequence of a ſlower admiſſion of water, the air was ſtill more efficacious.

I recommend the ſame precautions of mixing lime in the water of the refrigeratory, and of ſhaking the hydro-carbonate with lime and water in the air-holder, as for the oxygene; but I am not enabled to decide whether it is neceſſary to keep the air till it depoſits its charcoal, ſome Gentlemen think that on the contrary, it is beſt to uſe it when freſh made.

The great powers of the hydro-carbonate air require the doſe to be meaſured with the utmoſt accuracy, I therefore recommend that it be always meaſured out of the air-holder, by pouring in the meaſure of water as directed, and never meaſured by means of the hydraulic bellows, which is not ſo exact a method, eſpecially when the diameter is large.

The charcoal from which this air is prepared, ſhould always be previouſly well calcined, as empyreumatic vapours from half burnt wood, appear to be very deleterious; perhaps *they* may have their virtues, but it is deſirable to know exactly what is adminiſtered, and the virtues of ſuch airs may be very different from thoſe of the hydro-carbonate. J. W.

To Dr. Beddoes.

Caution from Mr. WATT.

THE utmoſt care ſhould be taken that no bits of coals, charcoal, wood, or other inflammable matter be mixed with the manganeſe in preparing oxygene air, and that none of the linſeed oil of the fat lute penetrate into the fire-tube: when any of theſe ſubſtances are mixed with the manganeſe, fixed air is produced, of an extremely pungent quality, and which it is apprehended will prove extremely detrimental in the generality of the caſes in which oxygene air would be directed.

Imperfectly burnt charcoal, or mixtures of oily ſubſtances with it, are hurtful in preparing hydro-carbonate; therefore it is hoped that the cautions given on that ſubject, as well as upon the preparing it free from fixed air will be attended to, and theſe repetitions excuſed. A patient who prepared oxygene air for himſelf, found it one day ſo pungent as to occaſion a ſenſe of burning in his lungs. The manganeſe was inſpected and a ſample ſent me. On examination I found it to contain nothing but manganeſe and iron as uſual.—There were no heterogeneous mixtures in the hogſhead out of which it was taken. Some mixture of inflammable matter I therefore conceive muſt have happened; and I know the fixed air ſo produced is too pungent to be ſmelled to.

J. W.

Extract of a Letter from DR. THORNTON, *On Catarrh.*

March 23, 1795.

I AM ſorry that the one I encloſe is a ſolitary caſe, but trials of this ſort may be eaſily multiplied, I can ſee no harm in publiſhing new trials provided theſe be accurate, and the trial is attended with ſo little proſpect of danger to the patient as in the preſent inſtance.

* * *

March 21, 1795, *Hollywell-ſtreet, Strand.*

SIR,

AS DR. THORNTON has requeſted me to relate to you my caſe, and as the communication may be of ſervice to others, I will give it as well as I am able, hoping for the indulgence of the critical reader, from the conſideration of the motive that has induced me to make it public. On the 18th of this month, I was for ſome time in a large room, which was much crowded and very warm. When I came out of this place, I perceived the wind to be very cold. It was eaſterly and I had to face it as I returned home. Upon getting into bed I took ſome brandy and water, and ſoon after felt myſelf uncomfortable and reſtleſs. On the next morning when I awoke I coughed frequently, and threw up a thin tranſparent mucus, which came up freely and with no pain. I was convinced I had caught a bad cold, for my colds are uncommonly ſevere, and theſe are the conſtant ſymptoms of their having ſeized me. The next morning after breakfaſt, my breaſt was very ſore, and my cough very troubleſome and painful.

The mucus became glutinous and ſomewhat difficult to diſcharge. After I had dined, and drank three glaſſes of wine, the oppreſſion and pain increaſed in ſeverity. Believing now I had an inflammation of the lungs from the pungency of the pain, I haſtened to ſee Dr. Thornton, who made me inhale the vapour of æther. I received from it almoſt immediate relief, both with reſpect to the oppreſſion as well as the pain in my breaſt. Nevertheleſs I continued much affected all the evening, and coughed a great deal, and when I expectorated I felt a ſoreneſs at my breaſt. Before I went to reſt I put my feet in warm water above half an hour, and took ſome warm gruel in bed. All this I have often done before, when ſo attacked, but ſeldom found much relief from it I had recourſe again, as directed, to the vapour of æther, and inhaled two teaſpoonfuls, which again gave me the ſame immediate relief as before. I very ſoon after fell aſleep, had a good night's reſt, and when I awoke in the morning, inſtead of difficulty of breathing, a long fit of coughing, my breath hot, my tongue dry and parched, as had been invariably the caſe after ſuch ſymptoms as above deſcribed, I breathed, on the contrary, freely, coughed only once or twice, and proceeded throughout the day in my buſineſs, without the ſmalleſt inconvenience.

I am, Sir,

Your obedient humble Servant,

THO. WINNE TOWNSEND.

To Dr. Beddoes.

Observations on this Case by DR. THORNTON.

1. THE manner of inhalation is very ſimple. Two tea-ſpoonfuls of æther are put into a tea pot. This is held near a candle, and the thumb is put over the ſpout. When the vapour begins to preſs upon the thumb, it is transferred to the mouth, and the air is drawn into the lungs. This is to be repeated until the whole be conſumed, or eaſe acquired.

2. That the vapour of æther is inflammable air we have the following proof.—I had often put æther into phials containing oxygen air, with a view to produce an exploſion, but it never exhibited any other phœnomenon than a blue lambent flame. One day having waſhed out a phial that contained æther, I transferred into it the vital air, and by way of ſhewing the properties of this gas, having blown out a lighted match, I conveyed the burnt end into the phial of oxygen air, but unexpectedly, inſtead of the match rekindling, a moſt violent exploſion took place. I then put two drops of æther into a ſtronger phial containing this air, and having warmed it with my hand, upon transferring the red-hot part of a match into the oxygen gas, it produced an exploſion nearly as loud as a gun: the match is ſhivered, caloric is diſengaged, water is formed, and the remaining air, after this proceſs, is incapable of ſupporting combuſtion. As the phial in this inſtance did not burſt, I have frequently repeated the experiment, and have always found that one drop of æther to an ounce meaſure of vital air, will produce the ſame phœnomena.

3. In a defluxion of the noſe, may not the morbid ſecretion be thickened, by ſtopping the mouth, and

drawing up an atmoſphere chiefly compoſed of fixed air? Chemiſtry, I believe, points out this as very probable; but ſuch conjectures will be at once determined by a proper public eſtabliſhment.

Letter from Dr. THORNTON.

July 27, 1795, *Great Ruſſel-ſtreet.*

DEAR SIR,

IN your letter to Dr. Darwin, dated June 20, 1793, having ſtated the reaſons that inclined you to think, "that in a certain claſs of conſumptive patients, there "may be a ſuper-oxygenation of the ſyſtem;" you ſubjoin, "that in conſtitutions injured by opium or "exceſs of ſpirituous liquors, (and more eſpecially "while they are under the operation of ſuch liquors "or drugs) there probably exiſts a deficiency of oxy"gene." The manner in which you attempt to prove theſe poſitions ſtruck me much, and the following facts will, I think, tend in ſome meaſure to ſupport the latter opinion.

Miſs F—— came purpoſely from Edinburgh, attended by her mother, to be under the care of Meſſrs. Wathen and Phipps. Labouring under a dreadful ophthalmia, ſhe had been excluded for the laſt ſix months from the cheerful ſtimulus of light. Living in a confined ſituation in London, and unable to uſe exerciſe abroad, ſhe had been conſtantly breathing a corrupt air. Seeing her worn down by pain; nearly deſerted by hope; deprived of ſleep, though ſhe took large doſes of opium; tormented with head-ache in the morning; and without the leaſt appetite during the day, Meſſrs. Wathen and Phipps did not think ſhe would ſurvive many days. Being called in by theſe Gentlemen I beheld the image of patience and wretchedneſs. The Lady's countenance and lips were pallid in the extreme. Her pulſe was almoſt too weak to be diſcovered. I before obſerved that Miſs F—— was in the habit of taking laudanum every evening, the quantity was 110 drops, from which ſhe latterly obtained but little ſleep. After inhaling the ſuper-oxygenated air her pulſe evidently increaſed in fulneſs; her ſpirits were rouſed; her appetite in ſome meaſure returned; and a leſs quantity of laudanum would produce the deſired effect.

I am, &c.

R. I. THORNTON.

To Dr. Beddoes.

Observations on this Case, made by Dr. THORNTON, *and* Meſſrs. WATHEN *and* PHIPPS.

1. FROM local fulneſs we judged it prudent to take blood from the eyes of Miſs F——. Her blood at firſt hardly coloured a white handkerchief; ſoon after ſhe had inhaled the ſuper-oxygenated air, it ſlightly tinged it; and in a fortnight the blood became of its right florid hue. WATHEN and PHIPPS.

2. The doſe of air given was from two to four pints of vital air, and leſs diluted than with moſt other patients. This was very ſpeedily conſumed.

3. Why the vital air is favourable to ſleep would deſerve to be explained. Nurſes, who are actuated by

no principle but obſervation, when they want to get an infant to ſleep, carry it into the *open air*; for the ſame purpoſe they ſing to it, or dance it about. Now are not theſe powerful ſtimuli exhauſting irritability, which prediſpoſes to ſleep? The partial abſtraction of the ſtimulus of vital air alſo produces the ſame effect, and more immediately, which was an improvement in medicine, firſt ſuggeſted by you, and will, probably, in caſes where ſtimuli are to be feared, ſuperſede the uſe of opium: in the mean time it may not be diſadvantageous to know how to obviate the after-evil of this prevailing medicine.

R. I. THORNTON.

Letter from MAJOR BRAITHWAITE.

Stratton-ſtreet, July 24, 1795.

SIR,

AS I had for a conſiderable time been troubled with rheumatic pains, it was recommended to me to take a mild opiate every night on going to bed, and in the event of that doſe not proving ſufficiently ſoporific, I was to add to it a few drops of laudanum; for which purpoſe I had procured a two ounce phial of laudanum, expecting to take a journey, where it might not be in my power always to procure medicine equally good of the kind. Nevertheleſs being unwilling to accuſtom myſelf to the uſe of opium, I generally poſtponed taking the opiate till extreme pain and want of ſleep rendered it abſolutely neceſſary. In one of thoſe moments, about four o'clock in the morning, I reached out my hand to the night table, on which by miſtake my ſervant had placed the phial containing the two ounces of laudanum, and believing this to be my uſual night-draught, I poured the contents into a tumbler glaſs and drank it off. I ſoon perceived my miſtake, not only from the taſte of the laudanum, but from my immediate relief from pain. From a certain pleaſing languor, it was ſome time before I could rouſe myſelf ſufficiently to ring the bell for aſſiſtance.— being however perfectly convinced within myſelf, that I muſt ſoon, unleſs my ſtomach was eaſed of the poiſon, beat a quick march into the other world, I made this effort and ordered ſome warm water; it was ſome time before it could be got ready. As ſoon as it was brought I drank large quantities, but without any apparent effect. The apothecary was ſent for, he gave me ſeveral ſtrong emetics before they took any effect, when I brought up a conſiderable quantity of laudanum. I afterwards had a profound ſleep, and very early in the morning inhaled the vital air, which was adminiſtered by Dr. Thornton, who ordered me to drink lemonade, which from the weak ſtate of my ſtomach, was almoſt as ſpeedily rejected, but *perfectly sweet* to the taſte, and ſo *deprived* of *all acidity* as left me no doubt of what I caſt up being only ſugar and water. This was frequently repeated with always the ſame reſult. In the evening I eat my dinner without any ſenſible difference, and felt the next day much as uſual. This is the ſimple fact to the beſt of my remembrance. If it can be of any uſe in a ſcience, which has for its object the eaſe and happineſs of mankind, I ſhall always look back with pleaſure to an accident, which has afforded me an opportunity of giving you this detail. I am, &c.

GEO. CHA. BRAITHWAITE.

To Dr. Beddoes.

Observations

Observations on this Caſe, by Dr. THORNTON.

1. AS more than an hour had elapſed before the emetic was adminiſtered, the opium though much diluted, muſt have taken conſiderable effect, and was not this proved by the quantity of vitriolated zinc neceſſary to be given, which the apothecary ſaid was ſufficient to vomit ſix ſtrong men?

2. Major Braithwaite's pulſe, which was commonly ſlow and full, was when I felt it, very quick and fluttering. Upon inhaling the ſuper-oxygenated air, I carefully obſerved by my ſtop watch, that it was diminiſhed near 15 beats in a minute; it alſo acquired fulneſs.

3. This Gentleman inhaled ſix pints of vital air, but little diluted with atmoſpheric air, we were both ſurpriſed to ſee how ſpeedily it was conſumed!

4. This inhalation gave great refreſhment for the time, as did the lemonade, which was taken into the ſtomach moderately warm: The idea of lemonade I derived from you.

5. Does not this caſe render it probable that opium diſoxygenates the ſyſtem?

Mr. BOOTHBY CLOPTON's *replies to queries reſpecting his perſonal experience of the inhalation of vital air.*

HAVING written a letter propoſing queries to Mr. Boothby Clopton, I received the following very ſatisfactory anſwers.

R. I. T.

July 19.

SIR,

AS Sir William Chambers, and other Gentlemen of rank and character in England, have conſented to authenticate the effects of the vital and other aerial remedies on themſelves, and as my motive for this application is no other than the extenſion of the moſt important of the ſciences, I am emboldened to requeſt the ſame favor of you. You, Sir, are ſo well known to move in the higheſt ſphere of life, that your teſtimony will greatly contribute to draw attention towards an inveſtigation, which I have no doubt will finally be productive of the greateſt general good. Permit me then to requeſt your anſwer to the following queries.

1. What was the nature of your indiſpoſition?

Anſ. Aſthma, accompanied with great debility.

2. How long had you been ill previous to your coming under my care?

Anſ. Seven months.

3. Did the Gentleman, who attended you, make any objection to your trying the vital air, or did he ſuppoſe other medicines would have had equal efficacy?

Anſ. Mr. Farquhar had no objection, medicines having been ſo long uſed without effect.

4. Was the diſeaſe after a time alleviated?

Anſ. Immediately on my inhaling the air; I was leſs oppreſſed with aſthma, and ſlept better the firſt night than I had done for ſeven months.

5. Did you find any alteration in your ſtrength and ſpirits?

Anſ. My ſtrength and ſpirits were certainly increaſed.

6. Did your friends obſerve any alteration in your countenance?

Anſ. Not only in my countenance, but in my perſon, for my nights being rendered good, I increaſed conſiderably in weight.

7. Has the advantage been permanent?

Anſ. I inhaled the vital air in the winter, and am now in perfect health, and as I took no medicine, I am convinced my recovery proceeds from inhaling the vital air.

Letter from Mr. COOPER.

Dacre-ſtreet, Weſtminſter, July 29, 1795.

SIR,

I WAS above nine months afflicted with hard tumours, which were very ſlow to ſuppurate, and when they did, produced only a watery diſcharge, and a ſore, that took a long time in healing. Theſe appeared chiefly about the mouth and throat. Previous to this, I had frequent eruptions on my face, for which I was often purged and bled, which in my opinion might have brought on the diſorder I am attempting to deſcribe to you. It ſoon became neceſſary to try every means to get rid of it, and I took a vaſt quantity of different medicines; but the tumours continued rather to increaſe in ſize and number, and produced a continual inconvenience to me. As the vital air alters the character of the blood, and I conceived my caſe aroſe from a broken ſtate of the blood, I waited on Dr. Thornton, who thinking theſe tumours very likely to be removed by the air, wiſhed me to make the trial. At that time ſeveral of the tumours were commencing, others were upon the point of breaking, and others again were in a ſtate of open ſore. My bowels were firſt cleared, and I inhaled the vital air, and took bark twice a day in powder. The effect the air had on me was as my mother and ſiſter obſerved, to make me eat more than uſual. I felt uncommon ſpirits, and no longer complained of chillineſs. The tumours that were in their firſt ſtate diſappeared; the others looked redder and gave me more pain, and diſcharged matter. But in a fortnight theſe alſo yielded to the air and diſappeared, and I was cured. But what ſurpriſed me moſt was the change it produced in my eye ſight. My eyes for the ſpace of fifteen years had been uncommonly weak; ſo weak, that I was never able to read or write by candle light, but from inhaling the vital air, they have acquired ſuch ſtrength, that latterly I I have ſat up writing in my books, ſometimes from twelve to one o'clock, without feeling the ſight the leaſt fatigued. My mother uſed to attribute my weakneſs of ſight, to my having had the meaſles very bad. I am at the preſent time perfectly well, and without any fear of my former afflicting diſorder.

I am, Sir, with the greateſt reſpect, &c.

HENRY FREDERICK COOPER.

To Dr. Beddoes.

Observations on this Case, by DR. THORNTON.

1. This cure was eſtabliſhed in Nov. 1793, when it was my cuſtom in breaking the balance of the conſtituent parts of the air, to incline more to the ſide of the vital air, and the patient inhaled daily 300 pints of common air, ſuper-oxygenated by four quarts of vital air.

2. Scrophulous tumours you have conjectured to ariſe "from a deficiency of oxygene, occaſioning inirritability in the ſyſtem." Was not this indicated by the blueneſs of Mr. Cooper's countenance; the ſlowneſs of his pulſe; the torpor of the tumours; and the weakneſs of his ſight, incapable of ſupporting the ſtimulus of a ſtrong light, for theſe diſappeared in proportion as his ſyſtem became oxygenated and the fibres ſtrengthened?

3. Having twice ſtimulated the ſeveral tumours with a ſolution of the oxyd of mercury, ſo as to produce ſome external inflammation, are we not to attribute ſome part of *their* cure to that proceſs?

R. I. T.

4. It is hardly neceſſary to point out to the reader, the inference deducible from this important communication with reſpect to the uſe of vital air in a well-known ſpecies of ophthalmia.

T. B.

Letter from Mrs. BENHAM.

July 9, 1795, *Fore-ſtreet.*

SIR,

I have been from my earlieſt youth terribly diſtreſſed with a nervous head-ache and weak digeſtion. This diſorder runs in our family. I had tried almoſt every thing, but without relief. I muſt confeſs, however, that while I inhaled the vital air, it did me good, but the diſtance was ſo far to attend, that I was obliged to leave it off, it interfered ſo much with my buſineſs.—It ſeemed at the time to remove a load from my ſtomach, my ſpirits were better, and my appetite mended. It certainly took off a weight from my ſtomach, but whether the walk overpowered me I cannot ſay, but my head-ache continued the ſame. My diſorder had affected my ſight, that I could not ſee ſmall print, but after about ten days from my trying the air, having taken up a prayer-book, and turned by accident to where there was ſmall print, I was aſtoniſhed to find I could read it. Having ſoon left off the air, perhaps before I had given it a fair trial, my ſtomach is now as bad as ever, and my ſight as before.

I am, Sir,

Your obedient Servant,

ANN BENHAM.

To Dr. Beddoes.

Mrs. Benham regularly attended the firſt week each day, and for a fortnight after paid occaſional viſits.

R. I. T.

Letter from Mrs. BROOMHALL.

July 23, 1795, *Stanhope-ſtreet.*

SIR,

DECEMBER, 1793, when I came under Dr. Thornton's care I had a bad digeſtion, and a head-ache ſo intolerable, that I believed, had I not been cured, I muſt have loſt my ſenſes. I inhaled the vital air, and by Dr. Thornton's order, I took an electuary of bark and ſteel, three times a day, having been firſt prepared for that medicine. From the firſt I gradually grew better, acquiring both ſtrength and appetite, and in proportion as theſe improved, my head-aches were diminiſhed. I attribute my increaſe of ſpirits and appetite wholly to the vital air, for a lady in perfect health going one day with me, out of curioſity, to ſee me inhale the vital air, having deſired Dr. Thornton to allow her to take ſome of it, her ſpirits were ſo high, and her appetite ſo good, that ſhe very much ſurpriſed the family ſhe was with on her return home.

I am, Sir,

Your obedient humble Servant,

ELIZ. BROOMHALL.

To Dr. Beddoes.

The diſorder here mentioned, had been coming on gradually for three years. She has no returns of dyſpepſia or head-ache, and is at the preſent time in very good health.

R. I. T.

Letter from Mr. COTTEREL.

July 6, 1795, *King-ſtreet, Weſtminſter.*

SIR,

I WAS troubled with great flatulence, heartburn, want of reliſh to my food, lowneſs of ſpirits, coldneſs of the hands and feet, and had ſlept very ill for more than five years. Before this time I enjoyed very good health; and to be employed in my occupation for my wife and family was a delight, but now it was attended with extreme uneaſineſs to myſelf. I was under the care of Dr. Liſter, Dr. Pitcairne, and other medical Gentlemen of the firſt eminence. I had taken a great load of bark and other medicines, and during theſe five years I changed firſt from one and then to another, and tried what different friends recommended, but in the end I only grew worſe. Having ſpoke to Dr. Thornton, he gave me ſome hopes, and by his direction I inhaled the vital air, and drank three times a day water impregnated with fixed air, in which I dropt 30 drops of æther three times a day. In a fortnight I was free from my complaint, but I continued for ſome time the water impregnated with the fixed air, in which ſome ſalt of ſteel had been diſſolved, and I have ſince occaſionally chewed a warm aromatic root, and for theſe laſt two years have enjoyed very good health.

I am, Sir,

Your obedient Servant,

MATTHEW COTTEREL.

To Dr. Beddoes.

Observations

Obſervations on theſe Caſes of Dyſpepſia, by

DR. THORNTON.

THAT common air conſiſts of two principles, viz. vital air and azotic air, was firſt ſatisfactorily proved by Lavoiſier: That the blood fixes within itſelf one of theſe principles, viz. the vital air, was perhaps the diſcovery of Dr. Goodwin. The extinction of this principle, before it enters the veins, thereby generating vital heat in the body, was the diſcovery of Dr. Crawford, to the perfection of which theory I might have ſlightly contributed: That there is a balance between the vital air taken into the lungs, and the quantity of food that can be digeſted by the ſtomach, was among your earlieſt diſcoveries. Theſe caſes ſeem to confirm your views, and unleſs there were danger of exhauſting the patience of your readers, I could direct you to many other perſons, from whom you might procure teſtimony to the ſame effect.

Note from MR. RUSSEL, *Engraver.*

Auguſt 1, 1795, *Conſtitution-Row, Grey's-Inn Road.*

SIR,

THE Rev. Mr. Townſend's account of my caſe is perfectly correct and expreſſive of my ſituation.—— Wherever I went, every one who knew me teſtified the greateſt ſurpriſe at ſeeing me ſo recovered. Since which time (nearly two years) I have continued in excellent health, having had no return of my former complaint.

I am, Sir, your moſt obedient humble Servant,

JOHN RUSSEL.

To Dr. Beddoes.

The caſe of Mr. Ruſſel, together with ſome others treated by elaſtic fluids, is related by the Rev. Joſeph Townſend in his *Guide to Health.* It was a caſe of *melancholia.* Oxygene air with other remedies were employed. The cure cannot therefore be fairly aſcribed to oxygene alone ; but the report ſhews demonſtrably that this remedy had efficacy. For when it was withheld, the ſymptoms grew worſe, and gave way when it was adminiſtered afreſh. T. B.

* * *

Letter from Dr. THORNTON.

August 6, 1795.

DEAR SIR,

I CANNOT better cloſe my communications than by the trial I have made of vital air in pregnancy. It had often been remarked, that pregnancy arreſts conſumption, but to you firſt we are indebted for an attempt to explain the manner in which this effect is produced. Allow me to lay your words before the reader. " The fœtus has its blood oxygenated by " the blood of the mother through the placenta.— " During pregnancy there ſeems to be no proviſion " for the reception of an unuſual quantity of oxygene. " On the contrary, in conſequence of the impeded " action of the diaphragm, leſs and leſs ſhould be taken " into the lungs. The dark colour of the blood; the " aching of the teeth, and bleeding of the gums ; the " propenſity to break out into ſores, their dark appear- " ance, and difficulty in healing ; the diſlike to animal " food ; and deſire of acids and vegetables ; alſo the

“ black appearance of the areolæ of the breaſts, pecu-
“ liar to that period; and the ſallowneſs of the coun-
“ tenance, ſeem to indicate a defect of oxygene.” In the preſent caſe moſt of theſe ſymptoms were ſtrongly marked; they were accompanied with great dyſpepſia and lowneſs of ſpirits. As with thoſe under the influence of wine (the theory of which we before had occaſion to conſider), there was defect of appetite in the morning, with nauſea and frequent inclination to vomiting. Inſtead of arterial, (for the Lady was in the vigour of life) there was venous plethora, and ſhe complained of univerſal chillineſs. I obſerved that acid fruits and vinegar were ſo much indulged in, as in another ſtate of the frame muſt have produced great evil. This indulgence was not however previous, but ſubſequent to the ſymptoms above deſcribed, and ſo far from augmenting ſeemed greatly to leſſen them.— Any ſmell tending to putreſcency would occaſion a total derangement in her conſtitution. Salt of vinegar and acids were very reviving, and would almoſt inſtantly ſtay the inclination to vomiting. In this ſtate a violent fright produced firſt fainting, and then convulſive fits; theſe alternations would afterwards appear at uncertain intervals, and laſt from two to three hours. Wine, laudanum, peppermint, and brandy, ſeemed the moſt ſalutary remedies, either by being a ſtimulus adapted to the torpor of the ſyſtem at that period; or elſe from the conſent which this occaſions with the lungs, whereby a larger portion of vital air is imbibed by the blood flowing through that organ. As things were thus circumſtanced, I thought of the vital air, and reaſon authoriſed me to make this delicate and intereſting trial. Therefore during one of theſe paroxyſms,

peppermint-water and wine being firſt adminiſtered, and the room ſprinkled with vinegar, I preſſed into the lungs ſuper-oxygenated air, and in a few minutes there was a moſt evident alteration for the better. This Lady being recovered, the ſuper-oxygenated air was inhaled afterwards for ſeveral days, and it ſeemed to bring back the frame to the natural ſtate of health, but I choſe not to perſiſt in the uſe of an unknown power, unleſs urged by the ſtrongeſt indications.

I am, &c.

R. I. THORNTON.

To Dr. Beddoes.

Letter from Dr. THORNTON, *reſpecting patients with impaired organs of ſenſe.*

DEAR SIR,

FROM the very quick reſtoration to ſight of the blind boy, whoſe caſe I have before related, where there was water oppreſſing the brain, and from the caſe of Patterſon, it was generally rumoured abroad, that *gutta serena* yields to the powers of the vital air.—This report gained the more credit, as a lad, who had been deaf—ſo deaf, that he did not even hear the Tower guns, though placed under them when they were firing, and whoſe mouth was drawn awry—by inhaling the vital air had entirely recovered the right poſition of his mouth, and could diſtinguiſh loud ſounds, as the Rev. Mr. Townſend and many others witneſſed. It was pleaſing to obſerve, how delighted he was at the exerciſe of this returning faculty, for not a carriage could paſs, nor a rap even at a neighbour's door, nor any loud noiſe, but he joyfully noticed it; on the firſt day of his hearing, his father ſaid, his extaſy was beyond expreſſion. He had likewiſe loſt the power of ſpeech, and therefore conveyed his meaning chiefly by geſture. The reſemblance which this caſe was ſuppoſed to bear to paralyſis of the optic nerve, made this idea general, even in the medical world. With regard to a partial paralyſis, we have in reality, one caſe ſomewhat in point.

A Lady of rank was recommended to me and Mr. Hill; ſhe had entirely loſt one eye, and the ſight of the other was ſo impaired, that ſhe could not read writing at all, nor any but the largeſt print; and ſtreams of light ſeemed to iſſue from the fire and the candles in the evening. There was no apparent defect in either of the eyes to any common obſerver, nor would any one in a room or carriage have imagined her ſight failed her in the leaſt. As the criterion to judge by, I requeſted this Lady, as ſhe paſſed by in her carriage, to try if ſhe could diſtinguiſh the hour at the Horſe-Guard's clock, ſhe found ſhe could not. She inhaled the vital air at firſt for a few days, and by the direction of Meſſrs. Wathen and Phipps, electricity was daily employed, and the vapour of æther was thrown with the electric aura on the eye. She took once a day a a tonic mixture, and before ſix weeks were elapſed, this Lady was able readily to diſtinguiſh the hours on that ſame clock which had before preſented only a confuſed object.

A Merchant came purpoſely from Jamaica, to be under Dr. Baillie, who with that liberality and love for the improvement of medical ſcience, ſo conſpicuous in the family of the Hunters, recommended him to Mr. Hill. I was in hopes I ſhould have been able to have furniſhed you with this caſe, and had long ago promiſed it; but from caprice ſo common among the ſick, without the leaſt ſhadow of ground, he deſiſted from the vital air, and gave up probably the only chance of recovery. A poor man labouring under total darkneſs from gutta ſerena, was humanely ſent laſt winter to Mr. Hill, by Meſſrs. Wathen and Phipps. His general health was eſtabliſhed by the inhalation of ſuper-oxygenated air. The pupils, I thought, ſeemed rather to contract upon the application of a ſtrong light, but the man living at a diſtance, and the winter being very ſevere, he did not attend much above a month.

With reſpect to ſuper-oxygenated air in true amauroſis no concluſion in my mind can be drawn from the caſe related by Dr. Carmichael; for the vital air was had recourſe to as a powerful exciting remedy; bleeding was on the ſame days employed, and a ſudden tranſition was made to an air diametrically oppoſite in its virtues. This accurate Phyſician purſued a very different mode in chloroſis with good effect at firſt, and I truſt, final ſucceſs. Upon the whole, "whether benefit will reſult from the vital air in true gutta ſerena" remains to be decided.

Ever your's,

R. I. THORNTON.

Letter from Dr. THORNTON, *on Yeast.*

DEAR SIR,

THE communication of the Rev. Mr. Cartwright, on the efficacy of yeaſt in putrid fevers, induced me to pay much attention to this remedy. It appeared to me an excellent ſubſtitute for the efferveſcing mixture, which extricates too little fixed air to produce any very important action in the conſtitution. As fixed air forms the chief ingredient in medicinal waters, it has been without much oppoſition introduced into the practice of medicine. Its great antiſeptic powers have been fully aſcertained. But in the preſent inſtance I am about to conſider it alſo in another point of view. From the experiments of Dr. Percival, it appears, that fixed air is abſorbed by the lacteals, and is ſecreted from the blood by the kidneys, ſo as to affect the water in the bladder; hence it becomes a ſolvent for the ſtone. From thoſe of Mr. Abernethy, it appears, that it is alſo abſorbed by the ſkin, and you conjecture, " that the conſtitution might be ſaturated by the immerſion of the naked body or limbs in veſſels containing airs." Theſe ſuggeſtions led me to a new mode of treating peripneumony. But it may be proper firſt to premiſe one or two trials of yeaſt in putrid fever.

Mr. Caldwell, ſome months back requeſted me to go into Green-ſtreet, Leiceſter-fields, to attend Mr. Hadril, who he ſaid, it was ſuppoſed, would not outlive the day. I found him labouring under a dreadful ſore throat: the tongue was black and thick coated, and the pulſe quick and fluttering. Evacuations being firſt employed, yeaſt and bark in porter were exhibited every two hours. His ſiſter, who nurſed him, was ſoon after attacked by the ſame fever, but the throat was not affected. She was not like her brother confined to her bed, but her weakneſs was ſo great that ſhe could not walk acroſs the room, nor even ſtand up half a minute without ſupport. In both theſe caſes the relief from the yeaſt was very ſtriking, and they were ſoon cured.

Mrs. Knight of Bolt-court, Fleet-ſtreet, had a white tongue ; proſtration of ſtrength ; the eyes gloſſy ; the countenance vacant, with a hecking cough ; great heat on the ſurface ; pulſe 120 ; complexion very florid. Having firſt given an emetic and cathartic, and well cleared the primæ vitæ, I ordered three table ſpoonfuls of yeaſt to be taken every two hours. After the ſecond repetition of this remedy, it brought on a great ſenſe of coldneſs ; the ſtomach was inflated with wind ; ſhe eructated continually ; and for two hours was threatened with hyſteria. As the loſs of the fever produced great faintneſs, her officious and alarmed friends, gave her their grand ſpecific for wind and lowneſs, Geneva and water. Finding on the next the day fever returned, and a prejudice againſt the yeaſt, I treated it according to the ordinary practice ; the inflammatory ſtage paſſed into the putrid, with twitching of the tendons, and other ſymptoms exciting alarm, and notwithſtanding bark and wine it run its courſe of one and twenty days.

Maſter Kennard, who lives with Mr. Stoner, Charles-ſtreet, was brought to me by his mother for my advice. He was alſo in the inflammatory ſtage of a putrid fever.

I ordered an emetic of antimony, and after this operation cleared the inteſtinal canal with rhubarb and vitriolated kali; the fever, though greatly abated, ſtill continuing, I recommended yeaſt, and the lad was in a few days perfectly recovered.

Having in the two laſt caſes aſcertained, that the ſthenic pulſe was ſunk by the operation of the fixed air, extricated in the warm ſtomach from the yeaſt, I conceived, that in violent inflammation it might ſometimes preclude the free uſe of the lancet, and a caſe happily occurred, at the cloſe of laſt winter, which ſeemed to authorize the trial.

Mr. Kennedy, a hair-dreſſer by trade, living in Tottenham-Court-Road, aged 35, of ſo nervous a frame that he could not ſhave his cuſtomers, (his hand being ſubject to tremble) was attacked with the prevailing inflammatory diſeaſe of the laſt ſpring, which took off ſuch a number of perſons. He was ſeized with rigor and head-ache, ſucceeded by acute pains in the cheſt; his breathing became laborious, and towards night he had violent delirium. I was ſent for early in the morning, and I obſerved 1ſt. a tenſe and oppreſſed pulſe; 2d. great heat; 3d. great difficulty of breathing; 4th. he complained of acute pain in the right ſide; and 5th. had total loſs of ſleep. I inſtantly called to mind Brown's ideas on catarrh. After a ſevere froſt, with ſnow on the ground, the weather became mild, and the *accumulated irritability* was by the heat called into action.—Had blood been taken from the arm, the blood partaking of the ſame *increaſed irritability* would have contracted ſtrongly, and we ſhould have had that cupped appearance, and hard coagulum ſo expreſſive of inflammation.

From this theory the art of cure ſeemed to be to adjuſt the ſtimuli to the tone of the irritable fibre, and as the ordinary ſtimuli produced inordinate action, from the increaſed irritability of the fibre, it became neceſſary to reduce theſe as early as poſſible. I was convinced, from former experience, that the oppreſſed pulſe would have riſen under the finger, as the ſtimulus of the blood was withdrawn; but as this fluid is with difficulty regenerated in habits like that of my patient, and in *this* epidemic bleeding had precluded quick recovery, I reſolved to omit for the preſent the abſtraction of this ſtimulus. But I ordered the fire to be put out; I removed the ſtimulus of light; I would allow no one to ſit in his room, or ſpeak to him: to take off the ſtimulus of food from the ſtomach I gave him an emetic of tartarized antimony; and to take away all ſtimulus from the inteſtinal canal, I ordered a cathartic of rhubarb quickened by vitriolated kali. During the operation of theſe, I applied a very large bliſter to the cheſt, the ſtimulus of which I conceived would do no harm under the operation of the cathartic, and might do good by deriving from the lungs, and afterwards by drawing off the ſerum of blood, which is a ſpecies of half bleeding. To ſupply oxygene without caloric, I ordered from ſix to ten lemons in the twenty-four hours, in tamarind drink. Not contented with this, I wiſhed the famiſhed ſyſtem to abſorb as much fixed air as poſſible, (whoſe ſedative power on the heart and arteries is ſufficiently proved) and he took therefore yeaſt in his acidulated water, and he was ordered frequently to plunge his arm in this fermenting ingredient. I ordered two grains of calomel to be taken at bedtime, the acid drink to be frequently repeated with the yeaſt, and I encouraged no hopes in my patient, and in the morning he was to take the cathartic before-mentioned, to which was added half a grain of tartarized antimony.

The next day I found the pulſe of my patient leſs oppreſſed conſiderably. I aſked him to attempt an inſpiration but he could not bear it. The want of ſleep was now eaſily accounted for. The lungs being in part a voluntary organ, as diſtention of the veſicles was acute agony, the mind was kept conſtantly alert in preventing a too free reſpiration, hence perhaps the reaſon why the breathing was alſo quick and laborious.

He had no return of delirium. I repeated the purges on the two following days. The pulſe became ſofter; the tongue looked leſs white; the thirſt was abated; the breathing relieved; he ſweated profuſely; and began now to covet ſome food. I now admitted the ſtimulus of light; I raiſed his hopes; and progreſſively adding different ſtimuli, I came to bark; and in leſs than three weeks he was about on his buſineſs and as well as ever.

Nearly about the ſame time I was called in to attend Mrs. Eaton, at Shepherd's Market. Her diſorder ſeemed leſs confined to the pleura, and extended more over the mucous membrane of the lungs. Her pulſe was 112, tenſe, full, and intermittent; her reſpiration extremely laborious; her cough very painful; and her expectoration great. The blood taken from the arm exhibited a cupped appearannce, and hard coagulum, and the buffed coat, which is perhaps a ſecretion from the arteries. She was attended by Dr. Reynolds, who wrote to me as follows:

SIR,

I SHALL be very happy in Mrs. Eaton's having your aſſiſtance, and I ſincerely hope that her inhaling a reduced atmoſphere will be of uſe to her. Her reſpiration is at this moment very laborious, if that can be relieved, I truſt that ſhe will do well.

Believe me with the higheſt eſteem and regard,

Dear Sir, your faithful Friend and Servant,

H. R. REYNOLDS.

Wedneſday, Jan. 21,
5 o'clock.

To Dr. Thornton.

* * *

I STAYED four hours with Mrs. Eaton, while I obſerved the effects of yeaſt in her caſe, during which time I gave her near half a pint. Her hands and arms were immerſed in this liquid in a ſtate of ferment, and it lowered the pulſe to 94, and produced ſo much coldneſs, languor and dyſpepſia, that for fear of her ſwooning, the window was obliged to be thrown up to let in the freſh air. The irritation on her lungs, ſhe ſaid, was leſs, and what ſhe expectorated was eaſy. She was bled in the evening, but no ſuch alteration of the pulſe, or languor was produced from bleeding, as from yeaſt.—After this operation, for two nights ſhe inhaled a reduced atmoſphere, but it occaſioned catchings of the breath, and augmented the pain. Only a ſmall quantity being inhaled at each time, from a general law in the animal œconomy, (now beginning to be underſtood) inſtead of leſſening, it *quickened*[*] the pulſe as Dr. Reynolds obſerved, at the time. As no material benefit was derived from this weak eſſay, it was omitted, nor have I ſince tried it. But I have purſued the other mode in two inſtances with the moſt pleaſing ſucceſs, not that I would recommend this plan in every caſe, but only with ſuch patients as are of a weak habit, and who therefore are ſooner affected by the abſtraction of ſtimuli. Might it not be conjoined with bleeding; and I muſt obſerve in the caſe of Mrs. Eaton, ſome Gentlemen of the faculty, who had previouſly ſeen her and given her up as loſt, are of this opinion, but trials in a Pneumatic Inſtitution would determine this.

From, my dear Sir,

Your ever faithful Friend,

R. I. THORNTON.

* * *

Letter from Dr. THORNTON, *containing general obſervations on his experience with airs.*

No. 3, *Bennet-ſtreet, St. James's, Auguſt* 2, 1795.

DEAR SIR,

IN almoſt all of the caſes in which I have adminiſtered elaſtic fluids, Mr. Hill, whom I have had occaſion to mention as a Surgeon, and who alſo practices Pharmacy, attended in the latter capacity, and becomes therefore an additional teſtimony to the efficacy of the vital air. A queſtion will here naturally occur.—— "*Have not the cases which I have related, or pointed out* "*for your inquiry, been ſelected from innumerable* "*others?*" I could on the contrary add conſiderably to the liſt of perſons cured: but confining myſelf to thoſe diſorders, which ſcientific medical men generally allow to be incurable, or at any rate very difficult to cure, I here ſolemnly declare, that of ſuch caſes I have recorded every inſtance, excepting thoſe of aſthma and vitiated ulcers of the leg, where the trials have been very numerous, and almoſt univerſally crowned with the moſt ſtriking ſucceſs. Out of the many trials in which the ſuper-oxygenated air has been at all employed, four only have terminated in death. Your readers ſhall be enabled to judge whether the ſmalleſt ſuſpicion can fall on the oxygen in any of thoſe caſes. One of them I have before related, where there was water on the brain, the ſecond was a Gentleman from America, whom when I firſt ſaw, I did not believe that he could ſurvive many days. He had, I ſuſpect, great adheſions, tying up the organ of reſpiration, and never took an eaſy breath, but while he was inhaling the ſuper-oxygenated air. He obtained a reſpite and relief for above two months; when complaining of coach-hire and former misfortunes, he very reluctantly gave up attendance, though the air was offered him free from expence. From almoſt that moment he lamented to his wife that he had loſt his *only support*, and ſoon after reſigned his ſpirit to that Being from whom it is derived. The third was a Gentleman who had a paralyſis of the lower extremities from a diſeaſed ſpine. Mr. Cruikſhanks, had employed cauſtics, and other remedies, but without ſucceſs. When he came under Mr. Hill's care, he could not retain the natural evacuations, and as this laſt ſymptom gave me reaſon to expect, he did not ſurvive to inhale the ſuper-oxygenated air above a dozen times. The fourth was a ſiſter of that experienced Surgeon, Mr. Sharp, in a caſe of cancer, where I was called in with Mr. Hill, to try the application of fixed air to the breaſt, and vital air internally; this plan gave ſome eaſe, but from the extent of the diſeaſe, and ſeverity of the froſt our apparatuſſes were deſtroyed, which were of glaſs, and we made therefore here a very imperfect trial.

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[*] I imagine there are few circumſtances (I never ſaw any) in which a lowered atmoſphere does not at the moment *quicken* the pulſe, while it weakens the action of the heart and arteries. T. B.

The vital air, which I have generally employed has been formed from manganeſe and oil of vitriol, which went through a very careful and tedious proceſs, before it was fit for uſe. The cautions employed I need not detail, ſince by Mr. Watt's admirable *Pneumatic Apparatus* the vital air may be obtained pure, and with equal eaſe, and probably with the ſame, if not ſuperior qualities.

I am, dear Sir,

Ever ſincerely your's,

R. I. THORNTON.

To Dr. Beddoes.

Letter from Mr. WATHEN PHIPPS, *Surgeon.*

Pall Mall, Thurſday, Aug. 5, 1795.

SIR,

UNDERSTANDING that you are collecting accounts of the various effects either ſeen or felt from the vital air, I embrace the preſent opportunity of tranſmitting the reſult of two caſes to you. I was firſt induced to recommend the oxygen air, from obſerving the very happy and immediate effect it had in removing violent ſpaſms, which had reſiſted in a relation of mine, all medicines for above ſix months.* Soon after this a very corpulent Lady, of about 60 years of age, applied to me for a chronic inflammation in her eyes: beſides which, I found ſhe laboured under the greateſt poſſible difficulty in breathing. She could not even walk from the coach into the houſe, without ſtopping more than once to recover her breath. After ordering what appeared to me neceſſary for her opthalmia, I recommended her to the care of Dr. Thornton for her dyſpnœa, requeſting to ſee her in a week. In this ſhort ſpace of time the amendment exceeded my expectations.—She had walked the greater part of the way from Bloomſbury, to my houſe; her reſpiration had become almoſt free; and her nights better than ſhe had enjoyed for a long time. She continued the uſe of the oxygene air for a month, and was moſt perfectly cured, and has never had any relapſe. Another remarkable inſtance of the effect of the oxygene air on the blood, came under my obſervation laſt ſummer, which I cannot forbear

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* Of this caſe there is a ſhort notice in my *collection of letters.* T. B.

bear mentioning. Miſs F——,* a young Lady from Scotland, was afflicted with a chronic inflammation of the eyes, which had continued ſome months before ſhe came to England. The tranſparent cornea had become opaque, and the eyes otherwiſe much injured. She was extremely emaciated and ſo debilitated, that it was with difficulty ſhe walked acroſs the room. A violent and conſtant pain affected the head, which was relieved only by ſleep; which ſleep was ſeldom procured, but from the exhibition of 112 to 120 drops of laudanum, the effect of which was no ſooner gone than the pain returned. Every poſſible means had been uſed without benefit, when the oxygene air was recommended: after breathing it about ten days her appetite began to return, ſhe was enabled to take an airing in the carriage, and ſhe had ſeveral good nights, with a much leſs proportion of laudanum. I had frequently been in the habit of ſcarifying the inſide of the lower eyelids, from which ſhe always found temporary relief. Prior to the exhibition of the vital air, the blood poſſeſſed ſo few red particles, that it ſcarce tinged the handkerchief, and appeared more like the ſtain from yellow ſerum than from blood. After ſhe had taken the air for ſome days, it gradually aſſumed a redder colour, and at laſt regained its proper red appearance; a ſtrong proof this, of the power of oxygene to change the nature of the blood.

With the ſincereſt wiſh for the ſucceſs of your laudable and humane deſigns,

I remain, Sir, your very humble Servant,

WATHEN PHIPPS.

To Dr. Beddoes.

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* This caſe the reader will recollect to have ſeen mentioned by Dr. Thornton alſo. T. B.

Letter from Miſs STEPHENS.

Auguſt 6, 1795. *Snow-Hill.*

SIR,

A YOUNG LADY, an acquaintance of mine, aged 20, having been two years ill, and under Dr. Carr, an eminent Phyſician, at Northampton, but continuing in the ſame ſtate, ſhe was ſent on a viſit to me, in order that ſhe might obtain the opinion of ſome Phyſician in London. Having had the pleaſure to ſee the greateſt benefit derived by a young Lady,* whoſe caſe was ſomewhat ſimilar, from the inhalation of the vital air, I was very anxious for her to make trial of the ſame means. The countenance of Miſs S—— was pale in the extreme; her lips very white; her breathing ſhort; ſhe was incapable of the ſmalleſt exerciſe; ſo wearied was ſhe in dreſſing herſelf, that even during this trifling exertion, ſhe was obliged repeatedly to lie down; her appetite was very indifferent; her ſpirits low; ſhe conſtantly complained of cold; and towards evening her legs uſed to ſwell. When we firſt went to Dr. Thornton's we were obliged to take a coach there and back, and even the getting out and in, and going up ſtairs ſeemed too much for her. At the end of five days, the change in her ſtrength was ſo great, that ſhe was able to walk back from Great Ruſſel-ſtreet, and in getting up ſtairs, inſtead of panting for breath at every four or five ſteps, ſhe could aſcend the whole flight with the greateſt ſpeed and eaſe. Her appetite was good; her ſpirits raiſed; her countenance ſhewed the ſigns of returning health;

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* This young Lady's caſe has never been mentioned in print. I underſtand the cure was complete and permanent. With others of the ſame kind it leaves little doubt of the powers of oxygene in theſe affections.

T. B.

and her lips, cheeks, and nails aſſumed a faint bluſh, which continued increaſing, until ſhe was in *every particular* reſtored to perfect health, and could walk to and back from Great Ruſſel-ſtreet, above three miles, with the utmoſt eaſe. When Miſs S——, after ſtaying with me five weeks returned to her friends, every one was aſtoniſhed at the great alteration, and indeed ſhe hardly appeared the ſame young woman.

I am, Sir,
Your obedient humble Servant,
CAROLINE STEPHENS.

To Dr. Beddoes.

Observations on this Case by Dr. THORNTON.

1. Did not the pallid countenance; the white lip and tongue; the dyſpnœa when in action; the ſemi-pellucid and poliſhed ſkin; the want of perſpiration; the black and pearly eye; the coldneſs of the frame; the dyſpepſia; the yellow appearance of the teeth; the lowneſs of ſpirits; the weak and quick pulſe; denote a deficiency of oxygene in the ſyſtem.

2. If the ſkin was torn (before the ſyſtem was oxygenated) there would ooze from the ſcratch, not blood, but a yellow ſerum. Is not the predominance of this fluid, the cauſe of that ſallowneſs of the countenance ſo frequently miſtaken for a diſeaſe of the liver, whence theſe perſons have the name of *bilious?*

3. As this young lady had been under ſuch excellent hands, may we not conclude the ſteel and aloetic cathartics inadequate to the alteration here produced? In other inſtances the vital air along with theſe, has ſucceeded, when either *alone* did not produce the deſired effect.

4. In ſeveral inſtances, when the blood has been oxygenated, and the ſyſtem ſtrengthened, I have employed *electricity* with the ſpeedieſt effect. In ſuch caſes I have not had occaſion for aloes or ſteel to remove the *emansio mensium.*

Letter from Mr. BARR.

Birmingham, 20th Aug. 1795.

DEAR SIR,

REBECCA STANLEY, ſervant to Mr. Watt, of Heathfield, about 35 years of age, of a ſlender habit of body and a narrow cheſt, was ſeized with the epidemic cold or influenza of laſt ſpring, and has ever ſince been afflicted with a tight dry cough, a pain of her ſide, and occaſional fits of difficult breathing. She would not conſent to have any medical advice, and had taken no medicines. A few days previous to my being conſulted, ſhe caught cold, which much aggravated all her complaints. The cough became almoſt perpetual, and on the 28th of July, the breathing became oppreſſed in a degree truly alarming. She could not bear a horizontal poſition, but was obliged to be ſupported upright in bed through the night.

Mr. Watt gave her an emetic early in the evening, which operated well, but produced no relief; ether and other antiſpaſmodics were given, and a large bliſter was applied to the breaſt, where a ſenſe of exceſſive tightneſs and conſtriction was felt, but yielded no benefit. She paſſed a very bad night, and I was ſent for early in the morning.

I found her ſkin hot and dry; her pulſe beat between 90 and 100 ſtrokes in a minute, and her breathing was very laborious. I gave her thirty drops of laudanum with a dram of ether in half a tea cupful of water. Her breathing was much relieved by it, and continued ſo during the day. I adviſed her to inhale a pint of hydro-carbonate in twenty quarts of common air, in the evening, and repeat the doſe, increaſed or diminiſhed according to its ſenſible effects, morning and evening; I likewiſe directed the laudanum to be repeated if urgent ſymptoms ſhould return; the dyſpnœa was ſtill further relieved by the inſpiration of the air, and ſhe paſſed a tolerable night; no more laudanum was given. Next morning ſhe had a pint and half of hydro-carbonate diluted as before. The breathing became very eaſy; at night ſhe had the ſame quantity, and ſlept better. Next day the ſenſe of tightneſs and conſtriction in breathing was nearly gone, but the cough continued troubleſome. The pulſe, was hard, ſmall, and quick, the tongue was white, and the pain of the ſide was not removed. I took ſix ounces of blood, which was much inflamed, from her arm, and gave her a quart of hydro-carbonate, which quantity I directed to be inſpired night and morning. I alſo adviſed three grains of James's powder to be taken every eight hours.

I ſaw her again on the ſecond of Auguſt. All the ſymptoms were much mitigated. The pulſe was reduced to 80, her nights were much better, but the cough was but little abated. The James's powder was directed to be continued a day longer, and the hydro-carbonate for a week; at the end of the week ſhe was in every reſpect well, except a little cough. I adviſed the continuation of the hydro-carbonate till the cough was entirely removed. This I found to be the caſe when I ſaw her three days ago—ſhe ſleeps well, and her pulſe is full and regular.

In the beginning of this caſe the extreme urgency of the ſymptoms induced me to uſe active remedies along with the hydro-carbonate, and it certainly did not impede their ſalutary operation. In the latter ſtage it had no aſſiſtance. Could demulcents, expectorants, or antiſpaſmodics, either ſingly or conjoined, have done more? Could they have done as much?

I remain, dear Sir,
Your's, &c.
JOHN BARR.

To Dr. Beddoes.

Letter from Dr. DARWIN *to* Dr. BEDDOES.

Derby, *Aug.* 12, 1795.

DEAR DOCTOR,

IN recording the efficacy of new medicines, caſes in which they do not ſucceed are uſeful as well as thoſe in which they do.

Mr. W——, about 60 years of age, was afflicted with hydrothorax, which had been gradually increaſing for about two years; he had been ſix or ſeven times relieved by taking tincture of fox-glove. He breathed about eight gallons of oxygene gas, from Exeter manganeſe, every day for about a week; it was at firſt diluted with about equal parts of atmoſpheric air, but he took it after a day or two undiluted, unleſs by the ſmall quantity of air which might be in the hydraulic bellows previous to the introduction of the oxygene.—He did not perceive either any temporary or permanent effect from it. After about a fortnight he was again relieved by the tincture of fox-glove, and again began to reſpire oxygene, which was undiluted, and took about ſix or ſeven gallons every day for about a fortnight, without any apparent effect, except that at laſt one parcel of air diſagreed with him, which was probably owing to ſome inflammable material, which had incautiouſly been mixed with the Exeter mangäneſe in putting it into the tube. In a few weeks afterwards he ſunk under the diſeaſe.

Mrs. S———, a young married lady, with light eyes and hair, had been long confined by a pertinacious head-ache; and was ſo far reduced, as not to be able to riſe from her bed, ſhe breathed about ſix gallons of oxygene gas daily, for three or four weeks, which was at firſt diluted with equal parts of common air, afterwards ſhe choſe to take it undiluted. She always found herſelf revived by theſe inhalations, and gradually recovered her health, and became ſtronger than ſhe had been for ſome years, and freer from the pains of her head. Though theſe pains of her head probably originated from decaying teeth; yet, as other people experience a decay of their teeth, without violent and permanent hemicrania, there muſt be ſome other cauſe; which may conſiſt in the too great ſenſibility of the ſyſtem to this aſſociation of the morbid action of the membranes of the teeth, or of the alveolar proceſſes with thoſe about the temple. This ſenſibility ſeems to have leſſened as the conſtitution became invigorated.

I have only to add, that it is probable, that the quantities of oxygene gas would have had greater effects, if it had been reſpired in a more dilute ſtate. And that I ſuppoſe the inirritability of the lungs to the ſtimulus of oxygene gas in the former caſe, might be owing to their being in ſome degree anaſarcous, like the limbs.

From, Sir,

Your's moſt ſincerely,

E. DARWIN.

Letter from Dr. PEARSON,

Birmingham, Aug. 23, 1795.

DEAR SIR,

WHEN I ſent you an account of the effects of oxygene air in the caſe of the chlorotic girl, Mary Rider, I mentioned that I had alſo preſcribed the ſame remedy to another patient affected with epilepſy, joined with amenorrhœa. This patient, whoſe name is Ann Smith, is about 18 years old; ſhe has been ſubject to epileptic fits for more than two years. When at the worſt ſhe had four or five fits in the day-time, and one or two in the night. At the time the fits firſt came on, the menſes, which had been regular before, ceaſed, and have never returned ſince. Several years ago ſhe was troubled with worms; but it does not appear ſhe has them now. Theſe particulars relative to the hiſtory of her caſe, have been collected from her mother, as the patient is incapable of giving an accurate account of herſelf, her underſtanding and memory being ſo much impaired as to amount to ſome degree of idiotiſm.

It was in January laſt, that ſhe firſt breathed oxygene air, the application of which, after two or three doſes, was then interrupted by the accident mentioned in my former letter. About half a year afterwards, viz. on the 4th of July, this remedy was repeated ; ſhe breathed 226 cubic inches of oxygene air largely diluted with common air. This application was continued till the 22d of the ſame month, (i. e. nearly three weeks), towards the end of which time, the doſe of the factitious air was increaſed to as much as 678 cubic inches. The inhalation was now diſcontinued, as it did not appear to be of any ſervice. Scarce any difference was perceivable after the inſpirations, except that the pulſe was fuller and quicker, and the countenance more coloured. But theſe effects muſt be owing (at leaſt in part) to the efforts of the patient in drawing in the air from the bag, and to a greater expanſion of the lungs (in conſequence of fuller inſpirations) than happens in ordinary breathing. It is noted in the minutes of her caſe, that on the 20th of July, ſhe ſaid, ſhe had not had ſo many fits as uſual ; but I am unwilling to give credit to her own words, and the more ſo, as about a fortnight afterwards, upon inquiry of her mother how ſhe went on, I was told ſhe was not at all better.

This ſhort ſtatement is extracted from the journal kept at our hoſpital. To go more into the detail of a caſe which is indeciſive either one way or the other, I thought would be uſeleſs. In the inſtance of epilepſy of which you have given an account in one of your publications, the ſymptoms were aggravated by oxygene air. In the preſent caſe, if it did no good, it did no harm. Whether in leſs complicated caſes of this diſcaſe it is capable of giving relief, is a queſtion which remains to be determined by future experience.

It is noted in the minutes of the hoſpital-journal that the patient ſometimes appeared more lively after inhaling the factitious air; and one day ſhe complained of a pain in her ſtomach. This circumſtance ſhows that her feelings were rendered more acute by the uſe of this remedy. May we not then infer, that oxygene air would be ſerviceable in caſes of amentia or fatuity?

In this epileptic patient, I ſuſpect ſome organic affection of the brain; which explains why the oxygene air, though adminiſtered in ſuch large doſes, produced ſuch little effect.

I am, Sir,

Your's truly,

To Dr. Beddoes. R. PEARSON.

P. S. So much has lately been ſaid in favour of *yeast*, as a remedy in typhus and other diſorders, that I have been induced to take ſome notice of it. Thoſe who have written about it, do not ſeem to have underſtood its nature thoroughly. They have looked only to the carbonic acid which it contains, without being aware of another active ingredient in its compoſition; I mean the *bitter principle of the hop*, which is preſent in a very concentrated ſtate in yeaſt, and is highly narcotic. It is to this principle that I aſcribe the violent effects which I have known yeaſt to produce when given internally. I have been witneſs to its operation in two caſes. Neither of them were fevers. In the firſt, the vomitings (which had come on before) were increaſed by it; and in the other inſtance it purged violently. In reſpect to its uſe *internally*, I cannot help looking upon it as a very doubtful remedy; but I can bear teſtimony to its good effects *externally*, in cutaneous affections. It ſhould be obſerved that there is a great difference between *old* and *new* yeaſt. By keeping, much of the carbonic acid air eſcapes, the maſs becomes leſs frothy, and its parts are brought into cloſer contact: hence old yeaſt, is bulk for bulk, much ſtronger than the new. I ſuſpect, too, that in proportion as it loſes its carbonic acid air, it becomes more powerfully narcotic. It is therefore a neceſſary precaution to proportion the doſe according to the quality of the yeaſt. The old is at leaſt twice as ſtrong as the new.

* * *

THE reader will recollect the interesting case of I. T. *so minutely detailed by* Dr. Carmichael, (Conſid. 2d. ed. p. 87.) *He had in Nov.* 1794, *an almost incessant cough, with copious expectoration, sense of tightness across the chest, much dyspnœa on the slightest exertion, pulse* 110—120—*nights restless, attended with profuse perspirations, and much emaciation. After a course of hydro-carbonate air, without medicines, he was strong enough by the end of February*, 1795, *to determine to return to his usual occupation. The following letter tells the event.*

T. B.

Letter from Dr. CARMICHAEL.

DEAR SIR,

I NOW communicate to you the ſequel of I. T.'s caſe. On the 1ſt of March 1795, (the date of the laſt report) he was continuing to gain ſtrength, his cough was leſs frequent, the quantity of matter which he expectorated was ſmall, his appetite was good, and he ſlept well. He found himſelf ſo well in every reſpect that he became anxious to return to his employment, and as I could not prevail upon him to deſiſt from his intention, I adviſed him firſt to inure himſelf gradually to the cold, by walking out a little daily. He complied with my advice, and continued to gain ground till the 9th of that month, when in the evening he was ſeized with the uſual ſymptoms of the influenza, an epidemic catarrhal infection, which at that time prevailed much in this place. The febrile ſymptoms ran high, and were attended by frequent cough and conſiderable pain in his ſide; he complained alſo of ſevere head-ache and unuſual languor, he was thirſty, his tongue was white, his pulſe 110.

15. Febrile ſymptoms continue; cough frequent but now attended with increaſed expectoration; pain of his ſide leſs ſevere; conſiderable dyſpnœa on the ſlighteſt motion; pulſe 115, ſmall and weak. Until this attack he inhaled twice daily a gallon of hydrocarbonate, diluted with four times the quantity of atmoſpheric air, but as his ſtrength waſted, it was found neceſſary to leſſen the quantity to one quart diluted as above.

20. Pain of his ſide ſomething eaſier, but his cough increaſed in frequency and his expectoration is more

copious. Reſtleſs nights; no appetite; ſtrength ſo much impaired, that for the laſt four days he has not been able to inhale the modified air; pulſe 120. I directed a warm ſtimulating plaiſter to be applied to his ſide, and five drops of tinctura opii to be given every four hours.

28. Pain of his ſide gone, but his other ſymptoms continue; bowels regular; has had better nights, but his ſleep has been attended with profuſe perſpirations; the tinctura opii was omitted, and he was directed to take at nearly the ſame intervals a ſmall glaſs full of port wine.

15th April. Complaints continue without material alteration. From this date he recommenced the uſe of the hydro-carbonate, beginning with it of the ſtrength of one pint to ſixteen quarts of common air.

25. At firſt the modified air occaſioned conſiderable vertigo, but he ſoon became ſo much habituated to its operation, that the quantity was increaſed to one, and afterwards to two quarts. His perſpirations have abated, his cough has been leſs urgent, the quantity of his expectoration has diminiſhed, and the dyſpnœa, with which he has for ſome time paſt been troubled on the ſlighteſt motion, is greatly alleviated.

3d May. Since laſt report he has experienced conſiderable amendment, pulſe 98. The quantity of hydro-carbonate was further increaſed to a gallon diluted with four times that quantity of atmoſpheric air.

15. He has continued to recover ſo much in every reſpect, that yeſterday he walked, not without difficulty, fourteen miles into the country.

From this time I did not ſee him till the middle of June, when he returned to this place with an intention to follow his uſual occupation. He was in every particular ſo much better, that he ſeemed to have recovered completely the ground he had loſt. I adviſed him to the country, to which he conſented, and he has ſince been occupied in hay-making, and more lately in reaping. I ſaw him a few days ago ; he cannot be ſaid either to cough or expectorate, except of a morning, and then in the moſt trifling degree, and his ſtrength is ſo completely reſtored that he has been earning wages equal to thoſe of the ſtouteſt of his fellow-labourers, with eaſe to himſelf and ſatisfaction to his employer.

I am, dear Sir,
Your's ſincerely,
JOHN CARMICHAEL.

Birmingham, 25 *Aug*. 1795.
To Dr. Beddoes.

My aſthmatic patient I. B. continues perfectly well. I cannot ſay ſo much for the chlorotic girl. By the uſe of oxygene her health has been amended four ſeveral times, but the menſtrual evacuation has never yet taken place. I. C.

* * *

Letter from Mr. ROLPH, *Surgeon.*

Thornbury, *Aug*. 7, 1795.

DEAR SIR,

IT is with peculiar ſatisfaction I inform you my oxygenated patient continues improving in health, and from preſent appearances, there is little doubt of his perfect recovery. I here ſend you his ſtate of health, previous to his commencing a courſe of oxygene air, and his daily report ſince.

W. Trayhern, aged 35, by trade a tailor, had about the middle of June, 1793, a ſlight diſcharge from the urethra, for which he took ſome pills preſcribed by a medical gentleman at Briſtol; in the courſe of ſeven or eight days after he complained of a violent pain in his foot, which alſo appeared tumefied. By the advice of an old woman he bathed it with palm oil and rum, by which means the ſwelling was in a few days reduced, and the pain mitigated. He remained tolerably well for three weeks or a month, at which time he experienced violent pains in the hips, which confined him to bed for three months; his arms alſo at the elbow and ſhoulder joints became much affected, and remained ſo nearly the ſame ſpace of time. After this he felt himſelf better, but a conſtant ſenſe of coldneſs remained, together with lameneſs and pain, eſpecially about the hips. In the latter end of Dec. 1794, the ſenſe of coldneſs increaſed, and in a few days after his joints were more violently affected. At this time it was recommended that he ſhould uſe mercury, in order to excite ſalivation; from an idea, that his complaints originated in the diſcharge he experienced in June, 1793. Being aſſured this would ſhortly reſtore him to health, he followed the advice. A ſhort time after ſalivation commenced, there was a violent hæmorrhage from the gums, he ſays nearly two quarts. But ſo far from experiencing the promiſed relief from this expedient, his pains and difficulty of motion were much increaſed. He had no power over the muſcles of the left leg and thigh; ſo that whenever he attempted to walk with the aſſiſtance of a ſtrong ſtick in each hand, he was obliged to exert the muſcles of the abdomen and pelvis in a very peculiar way. Indeed the muſcular activity was ſo generally impaired that he could not turn in bed without ſomewhat to hold, and even then the exertion was moſt painful. He had been unable to turn in bed for a year and half; and for eight months unable to ſtoop. His nights he paſſed in pain, and generally was a ſtranger to ſleep. Though his appetite was good, his body was greatly emaciated, and during unſettled weather he felt intolerable pains. When he ventured out he was truly a ſpectacle that could not fail to excite the attention and commiſeration of every one he met. In this deplorable ſtate he was pointed out to me, on Saturday July 4, 1795, by a gentleman in the neighbourhood, of great humanity and obſervation: on Sunday the 5th, I had a converſation with him and learnt the above particulars.

As there did not appear to be any organic affection, I determined to try the effect of oxygen, which from the general ſtate of the muſcular ſyſtem ſeemed to promiſe relief. Being not then provided with any air, I begun on Monday the 6th, with giving him pills compoſed of bark and ſteel, and an opiate at night: Tueſday felt as uſual; Wedneſday he inhaled three quarts of oxygene gas, mixed with ſo much common air as to fill the bag; the medicines were continued; Thurſday he had a good night, in other reſpects he felt as before; Friday he had a good night, and to uſe his own expreſſion, felt himſelf lightſomer; Saturday he thonght he moved with greater eaſe and leſs fatigue; Sunday he was better, and able to turn himſelf in bed; Monday muſcular motion performed with greater eaſe, and he was able to ſtoop to pick up any thing from off the ground; which he had not been able to do, as I before obſerved, for eight months; Tueſday he paſſed a good night, and felt himſelf warmer than before: in the morning came down ſtairs, and walked to my houſe, the diſtance of 100 yards, with the aſſiſtance of one ſtick only; Wedneſday in a mending ſtate, he felt ſuch a genial warmth all over him as he had not experienced ſince 1793. Thurſday as the day before; Friday he felt himſelf ſtronger and a greater glow through the whole frame. Saturday he walked a ſhort diſtance on plain ground without a ſtick; Sunday, Monday, and Tueſday in the ſame ſtate; Wedneſday notwithſtanding change of weather, he did not feel thoſe pains he had been accuſtomed to. Thurſday he was able to bend the left knee in walking; Friday complained of great pain in the heel and a little in the knee; his medicines were diſcontinued and a quart of oxygen added; Saturday as the day before; Sunday the heel and knee were relieved, paſſed the night free from pain, but without ſleep. Monday he had a reſtleſs night but free from pain, is able to walk ſeveral hundred yards upon plain ground without a ſtick; Tueſday he had a reſtleſs night, but in no pain, walked with the aſſiſtance of one ſtick nearly a mile; Wedneſday had little or no ſleep, but free from every uneaſy ſenſation. He ſat at work croſs-legged the whole day, which he had not been able to do for two years and better.— The anodyne pill was again taken. Thurſday he ſlept well; Friday he complained of ſlight pain in his hips; Saturday he was better. He began inhaling the factitious air twice a day, omitted the opium and ſlept well. Sunday, though the weather was very ſtormy, and ſuch as greatly affected him before the uſe of oxygen, yet he found himſelf quite free from pain.—Slept well without opium. Monday free from pain, continues mending; his countenance evidently altered for the better, and he regains fleſh. Tueſday went to Briſtol in a cart, and there to continue a few days. Slept well without opium.

In regard to your little patient, I have the ſatisfaction to ſay he is *much* better, from the uſe of yeaſt and carbon. I have in ſeveral other inſtances experienced its beneficial effects, particularly in one caſe; a child long afflicted with ſcabby face, and become a ſad ſpectacle, obtained relief in a few days, and the face was perfectly clear in three weeks.

I am, your's,

With reſpect,

THOMAS ROLPH.

To Dr. Beddoes.

The Case of Dr. CRAWFORD, *Phyſician to St. Thomas's Hoſpital.*

To Dr. Beddoes.

Bennet-ſtreet, St. James's, Aug. 20, 1795.

DEAR SIR,

AS every incident reſpecting a character of ſuch celebrity as Dr. Crawford, muſt intereſt the public at the preſent moment, I am happy that the converſations which paſſed betwixt him and me, were held in the preſence of others. Having related to him ſome cures performed by a *reduced atmosphere*, which I propoſe at ſome future time detailing at length; I next repreſented my own ſituation, and attributed my recovery from phthiſis 1ſt. to my breathing an atmoſphere with a diminiſhed proportion of oxygene; 2dly to my exhauſting that principle by continued exerciſe on horſeback, as well as from the quality of my food; and 3dly, to my increaſing the powers of the abſorbents by the vertiginous motion on ſhip board, and now and then by a nauſeating emetic.

I mentioned alſo my freedom from complaints in my cheſt, while in the moiſt air of Cambridge, and that having not long back gone to Oxford, to ſee ſome friends at the Univerſity, I was almoſt immediately affected with pains under the ſternum, and had other marks of pulmonary affection. "You are right," Dr. Crawford exclaimed with an emphaſis I ſhall never forget, ſo contrary was it to his mild character. "I was obliged to remove from the ſharp air of Ken-"tiſh-town, which I am certain did me harm, to the "ſofter air of Somerſtown: but in my caſe there are "counteracting cauſes, and my ſtomach and bowels are "in ſo weak a condition, that I fear I ſhall not be able "to give your air a fair trial. Nevertheleſs, I am fully "perſuaded of the theory ſuggeſted by Dr. Beddoes, "and I have endeavoured to make its importance be "attended to by the faculty; and if the hydro-carbo-"nate does not ſucceed with me, it will be underſtood "why thoſe who have weak digeſtive organs ſtand a "poor chance in pulmonary complaints, which is a "ſtill further corroboration of the juſtneſs of the

" theory." We diſcourſed then on the theory of the hydro-carbonate, and he was of opinion with you, " that as this factitious gas produced a far greater effect " on the animal œconomy, than either inflammable or " azotic gaſes, its action could not be ſolely the excluſion of oxygene from the blood, but that the carbon " combined with the ſmall portion of oxygene already " there, and formed with it fixed air." Having prepared the hydro-carbonate according to the direction of this able chemiſt, Dr. Crawford inhaled after dark nearly a quart diluted with 500 pints of common air. He declared " that it transfuſed over his body at the time a *soothing tranquillity*, ſuch as opium is known to produce, but with ſlight vertigo." The following day he mentioned to me and Mr. Hill the circumſtance of the *correction* of the offenſiveneſs of his expectoration, which he ſaid, " he wholly attributed to the hy- " dro-carbonate air, as he had often taken myrrh and " quaſſia without this effect." Dr. Crawford omitted the laudanum at night, which he had been accuſtomed to take to check a diarrhœa, which diſorder unfortunately recurring, he was defeated in his hopes of the hydro-carbonate ſupplying with him the uſe of opium. He however inhaled a ſecond and third time the modified air, ſoon after which he went to Lymington, " with a fever," as he told me, " on his ſpirits," and there in a few months this great and good man paid the debt to nature. Nearly about the ſame time I was requeſted to go to Southampton, to attend Mr. Adams, the optician, who laboured under a ſimilar diſeaſe of the cheſt; ſo reaſonable are the ſuggeſtions, which the new chemiſtry has introduced into minds nurtured in philoſophy; I have only to regret, that my medical

engagement

engagements in London, were ſuch, as prevented my making in theſe intereſting caſes a full trial of the aerial practice. I am, &c.

R. I. THORNTON.

AT the time of Dr. C.'s inhalation of hdc. I received an account correſponding with the above; but had no idea of putting it into print, ſuppoſing that three quarts of hdc. taken at three different times, in a caſe of conſumption, were much the ſame as if none had been taken. It is only in compliment to Rumour, that I now publiſh a fact ſo totally irrevelant. T. B.

* * *

Note from Mr. Yonge.

Auguſt 27, 1795.

I TRIED by way of experiment how long I could retain one inſpiration of common atmoſpheric air, with a ſtop-watch before me, and found it to be twenty ſeconds. I then inhaled common air mixed with nearly an equal part of oxygene air which I ſuppoſe enabled me to retain it 32 ſeconds. Laſtly, I inhaled oxygene, ſuch as manganeſe yields. This was retained, by nearly the ſame effort 55 ſeconds, without that ſenſation of heat in the ſtomach, which reſembled the feel occaſioned by weak peppermint-water, and which I had experienced before, upon inhaling diluted oxygene.

GUSTAVUS YONGE.

* * *

Note from Mr. R. Edgeworth.

June, 1795.

I CAUGHT cold: next day had great tightneſs over my cheſt. I breathed at ſeveral intervals a bag of modified air; during the time I felt giddy, and was obliged to deſiſt for ſome minutes. My tightneſs however was completely carried off and did not return. My cold became quite trifling. R. E.

The quantity of air reſpired was five quarts of hydrogene with near 35 of common air.

* * *

Letter from Mr. SANDFORD.

Worceſter, Auguſt, 1795.

DEAR SIR,

WHEN I had the pleaſure of ſpending a few hours with you ſometime ſince at Clifton, I think you informed me that you were of opinion, the carbonic acid air might be uſeful in conſequence of being abſorbed by the ſkin, though there ſhould be no breach or ulceration. This converſation I believe aroſe in conſequence of an idea ſuggeſted by Mr. Jeffreys, viz. "whether it might not be found advantageous in cancerous diſeaſes, *before* ulceration commenced, to puncture the tumour in order to admit the aeriform remedies."

That the virtues of charcoal when *externally* applied, have been manifeſt *without any ulceration*, the following reports, will, I preſume, be admitted as proofs.

CASE I.—T. P. æt. 54, came to the Worceſter Infirmary May 24, 1795, with a mortification of the left foot and leg, extending half way up the thigh. About a fortnight before his admiſſion, Dr. Johnſtone being at the houſe where the patient reſided was deſired to viſit him. The Doctor has ſince favoured me with an

account of the ſtate in which he found him. "His
" pulſe tremulous and vacillating, very low and quick,
" his foot ſwelled, and the leg as high as the calf of
" a dark gangrenous colour, with ſlight veſications.—
" His abdomen, inflated, hard, and tumid, with fre-
" quent evacuations of thin dark coloured fæces; his
" tongue black and dry, extreme reſtleſsneſs and low-
" neſs: I allowed him cider in abundance, and pre-
" ſcribed Cort. Peruv. pulv. 2 ſcr. Caſcarill. ſcr. ſſ. M.
" alternis horis ex Cyath. Vin. Oport. rubr. The
" carbonic cataplaſm, prepared in the manner men-
" tioned in the 2d. edition of *Conſiderations*, p. 125.
" was ordered to be applied, and I adviſed the patient
" to go to the Infirmary."

He was admitted an in-patient as before-mentioned, on my day of receiving patients. The poultice had by this time produced a great change for the better, in the colour and appearance of the leg and foot, but the thigh was now alſo become hard and inflamed. Some of the veſications had terminated in ſmall abſceſſes, which diſcharged good pus. The charcoal poultice which ſeemed hitherto to have had ſo good an effect in checking the progreſs of gangrene *before* any ulceration had been formed, was ſtill continued, and with the moſt beneficial effects; he was put upon a courſe of the extract of oak bark with Caſcarilla, and took likewiſe lb. ſs. of port wine made into negus, at firſt in the courſe of 12, and afterwards in 24 hours.—The poultice was continued to the leg and thigh, for upwards of a month after his admiſſion, and was then laid aſide and mild digeſtives were applied to the ſmall ulcers which were even now very numerous, and principally ſituated in the general direction of the external lymphatics from the foot to about the middle of the thigh: theſe, though very troubleſome and painful during their formation ſoon granulated with a healthy aſpect: and when his appetite was reſtored, he laid aſide the uſe of wine and was allowed lb. ſs. of ale per diem, in its ſtead. He took occaſionally a grain or two of opium at bedtime, when the pain in conſequence of the formation of the little abſceſſes required it—theſe were all ſuffered to break ſpontaneouſly, and of courſe healed ſooner.

The man was diſcharged with the perfect uſe of his limb, and Auguſt 1ſt, was made an out-patient till he recovered his general health.

CASE II.—W. G. æt. 75, was entered in the liſt for admiſſion as an in-patient of the Worceſter Infirmary, Saturday July 4. At that time there being no room in the houſe, he was obliged to remain an out-patient till the following week. He had at this time ſeveral ſwellings of the carbuncle ſpecies, extending from the neck along the courſe of the lower jaw on the right ſide, and one, particularly hard and livid, juſt below the condyle of the jaw; his pulſe was feeble and, his whole frame in a ſtate of extreme debility. Dr. Seward, the receiving-phyſician of the week, examined him with me, and recommended a generous diet, together with bark and opium internally. Though I almoſt deſpaired of any good effects from the application of charcoal *before* he could be taken into the houſe, yet I determined to make a trial of it in this caſe, and the man's wife (who came with him) appearing an intelligent woman, I gave her directions how to prepare the poultice, to which ſhe promiſed faithfully to attend. The Saturday following a bed was reſerved for him in the Infirmary, and I was very much ſurpriſed to find the extraordinary good effects the treatment had produced. It was not found neceſſary to continue the poultice after his admiſſion, more than three or four days, every ſymptom of gangrene had diſappeared; his appetite began to return, and he was now directed to take the extract of oak bark with aromatics and chalybeates. Some of the ſwellings had entirely ſubſided, and the largeſt was conſiderably reduced, and diſcharged a ſmall quantity of well-digeſted matter. A plaiſter of ſoap cerate with camphire was applied over the tumour, and renewed every ſecond or third day, as occaſion required; this in a ſhort time removed the hardneſs, and the man after being three weeks in the houſe, was recommended to go into the country again, in order to eſtabliſh his health, which had been much impaired by his complaints.

CASE III.—E. M. æt. 40, had been troubled upwards of two years with an affection of the noſe, that withſtood a variety of applications, as well as internal remedies. For the laſt twelve months ſhe applied mercury in various forms to the part, and took many of its preparations internally, joined at different times with antimony and hemlock; poultices and fomentations of hemlock were alſo had recourſe to, and perſiſted in the uſe of, for a conſiderable time without affording any relief. For the laſt month ſhe has applied the carbonic poultice in the evening, and kept it to the part till the next morning. *This* application has already produced the moſt beneficial effects; though fixed air had been applied in immediate contact with the part, from the mouth of a phial containing the efferveſcing mixture, without effecting any relief. The point of the noſe, which had lately a very carcinomatous appearance, has now loſt its hardneſs, inflammation, and pain, and the ſmall tubercles and cracks have entirely diſappeared. How it may finally terminate it is impoſſible for me to pronounce, but ſince the charcoal cataplaſm has been applied, its general appearance has been much more favourable than from any previous mode of treatment. The ſequel of this caſe you may depend upon having.

When ſtill farther experiments have been made with charcoal, it will, I doubt not, be found one of thoſe ſingular ſubſtances, whoſe peculiar effects have for a great length of time eſcaped the obſervation of men of ſcience, till by the recent diſcoveries in chemiſtry its extraordinary powers were made known to ſociety.

I am, dear Sir, your's, &c.

To Dr. Beddoes. W. SANDFORD.

P.S. A Lady to whom I recommended the uſe of charcoal-powder as a dentrifice, was ſubject at times to violent tooth-ache, from one of the dentes ſapientiæ that was become carious. She one day when in great pain filled the cavity of the tooth with the charcoal dentifrice, and was ſurpriſed to find herſelf in a few ſeconds perfectly free from pain. It might probably be urged, that *any* ſubſtance filling the hollow of the teeth mechanically, and thereby preventing the acceſs of atmoſpheric air, would produce the ſame effect. But I am rather inclined to attribute the *temporary* good effect experienced in this caſe, to the power of the charcoal—*Query*. Could the oxygene in the tooth by a combination of theſe two principles act as carbonic acid air?

August 30, 1795.

I HAVE now the pleaſure to inform you that E. M.'s noſe is perfectly well. This is a proof of the ſingular efficacy of charcoal after the failure of every other medicine.

W. SANDFORD.

I HAVE endeavoured elſewhere to ſhew that carbonic acid ſpecifically ſtimulates the abſorbents. The ſoftening of glands was very evident in a caſe of cancer—I think charcoal has the ſame property. This important caſe ſeems to prove it. For how could the tumid noſe be reduced without greater action of thoſe veſſels? In the application of charcoal poultice to bad legs where the ſkin was broken I have ſeen other proofs of this fact.

T. B.

* * *

September 3, 1795, *Bennet-street, St. James's.*

DEAR SIR,

IT gives me ſincere pleaſure to be able to ſend you the following very ſatisfactory letter, which completes the evidence in favour of your opinion, reſpecting the effects of ſuper-oxygenated air in caſes of *ill-conditioned* ulcers of the leg. The reader will find theſe views in the letter to Dr. Darwin, which you publiſhed June 20, 1793, page 56 to 59, and which led me firſt to the trial of the vital air in the complaints you enumerate there.

I am, &c.

R. I. THORNTON.

September 1, 1795, *Store-ſtreet.*

SIR,

I WAS about eighteen years diſtreſſed with a dreadful humour covering the whole of the lower part of the left leg. It aroſe from water firſt in that part, and a tendency to the dropſy. I was four years under Surgeon Pott, 27 months under Sharp, 9 months under Blick, 27 months under Wade, and for ſome time under other eminent ſurgeons, but the humour continued as before. Previous to my attendance on Mr. Hill, I was very bad indeed, in great pain, and not able to walk fifty yards. After a fortnight from inhaling the vital air, I felt a moſt intolerable itching in the leg, and ſoon after the humour ſcurfed away, and the leg was healed. It is now eleven months, and I have felt no pain whatever, nor has even a pimple appeared on the part, and as before I could not walk an hundred yards, now nothing impedes my walking but my corpulency, which aroſe from my former confinement.

I am, Sir,

Your obedient Servant,

ELIZ. MUNT.

To Dr. Thornton.

Obſervations on this caſe.

1. IN fat people I have obſerved that ſuper-oxygenated air uſually creates ſome diſturbance in the ſtomach. This at firſt ſurpriſed me, but did not the ſuper-oxygenated blood feed upon the elements of fat, and thereby prevent the ſupply of food from the ſtomach, and that organ being robbed in ſome meaſure of its office, might it not at firſt feel the want of its cuſtomary action?

4. Fat people I obſerve are longer in conſuming a given portion of air than others.

5. In the preſent caſe ſtrong occaſional evacuations were employed. In the intervals bark with the tincture of the ſame, and myrrh were given to ſtrengthen the fibre and promote the conſent which exiſts betwixt the ſtomach and the lungs.

6. The average doſe of air employed, was 1500 pints of atmoſpheric air, ſuper-oxygenated with from three to four quarts of vital air. R. I. T.

* * *

August 1, 1795. *Islington.*

SIR,

FOR more than two years the whole ſurface of my face was covered over with eruptions. To deſcribe my real ſtate would be as diſguſting for you to hear, as it was diſagreeable for me to bear. I had tried different purifiers of the blood, but the humour in my face continued the ſame. Hearing that the vital air altered the ſtate of the blood, about nine months ago I placed myſelf under Dr. Thornton's care, and began the inhalation of the vital air. In leſs than ten days I felt a very great itching, which I do not remember to have had before. The itching however ſubſided, and my face was quite cleared in about a month. This ſtate continued four months, when I had a relapſe, but it ſoon gave way to medicine, and my face has continued ſince perfectly clear or only here and there a pimple appears.

I am, &c.

JOHN CUMMINS.

Obſervations on this Caſe by Dr. THORNTON.

1. THIS patient in early times had led rather a free life, and of late he could not get to ſleep unleſs he took a certain portion of wine in the day. Does not this caſe, therefore, confirm your opinion reſpecting the effects of vinous liquors, and did not the hydrogenous principle which abounded in his ſyſtem manifeſt itſelf by the humour covering his face?

2. As the ſame quantity of liquor was taken as before, and only three ſix-ounce phials of bark with myrrh, may we not aſcribe this cure chiefly to the artificial oxygenation of the ſyſtem?

3. As the body abounded in hydrogene, a larger proportion than uſual of the oxygene air was given this patient, and it produced at the time a ſtrong perſpiration, and ſeemed, as he expreſſed it, to ſearch every part of his body.

4. When the relapſe occurred, he took an oxyd of of mercury, and the oxygenation of the ſyſtem through this means produced the ſame effect; but as being productive of nauſea, and violent griping; is not the oxygenation of the blood by the lungs, a more elegant and preferable mode? My patient obſerved, that while taking the vital air his ſtrength was increaſed, but when under the courſe of mercury it was greatly diminiſhed.

Obſervations by Dr. THORNTON, *on the latter part of* Dr. PEARSON's *Letter.*

AS the public are ſo eaſily *prejudiced* againſt *new remedies*, and wiſh ever to be cured by inert ſubſtances, acting like charms, it may be neceſſary to comment on the evils that are ſaid to ariſe from yeaſt, as mentioned by this judicious phyſician. To aſcertain the action of remedies is of the firſt conſequence; to diſcover their mode of action is the next, which paves the way for future improvements, and diſtinguiſhes the phyſician from the empiric. In no inſtance has vomiting occurred with me, from the exhibition of yeaſt (the ſtomach and bowels being firſt cleanſed) but ſuch effects as reſemble *hysteria*, and the continued eructations of air, ſeem in my mind, to indicate the modus operandi. It was curious to obſerve, that when my patients plunged their arms into yeaſt in a ſtate of fermenting, it produced *eructations*. I happened lately to get a dreadful ſcald, and the pain was exceſſive; I tried yeaſt poultices, and obtained almoſt inſtant eaſe. Do not the effects of the fixed air, and of the carrot and yeaſt poultices in cancer, clearly ſhew that they act by one and the ſame principle? The ſame may be obſerved of mortification. Knowing the effects of wind on the ſtomach, can we then doubt of this being the prime agent? Not that I mean to deny the *bitter principle of the hop*, any more than the neutral baſis of the effervescing mixture: but I would place it in the ſecondary ſtation. The queſtion was I think cleared up by the Geneva, which ſoon baniſhed the wind, and gave relief. It may at once be decided by this able chemiſt, if he will firſt extricate the air from the yeaſt, and then exhibit it in caſes which may demand its bitter and narcotic qualities.

Letter from Dr. THORNTON,
On Inoculation.

Bennet-ſtreet, St. James's, Sept. 1, 1795.

DEAR SIR,

THERE is no plauſible reaſon againſt *general inoculation*, but the danger which pregnant women run.—From your explanation of the change wrought on the conſtitution by child-bearing, I conceived an hope, that this great improvement in medicine, admitted even of farther perfection. I fixed upon the month of May, 1794, to aſcertain this point, and as the ſmall-pox is evidently inflammatory, I choſe this month in preference to March or April, when the fibre, rendered more irritable by the preceding winter, is ſtrongly affected by every ſtimulus ; as alſo for another reaſon, in order that my patients might live upon gooſeberry food, which is not only pleaſant and nutritious, but affords to the ſyſtem *oxygene* uncombined with *caloric*, and acts alſo as a mild aperient. Having firſt well cleanſed the inteſtinal canal, with rhubarb and vitriolated kali, I followed your idea of greatly diluting the variolous matter,* and in order that as little as poſſible might be carried by the abſorbents into the ſyſtem, I gently raiſed with a lancet the ſkin on the deltoid muſcle of the left arm, and when all inflammation was ſubſided, I inſerted under the ſmall ſcratch the dilute variolous matter with the point of a needle.

In the firſt trial a circle of inflammation, reſembling the bur of the moon in a miſty night, was obſerved around the place where the variolous water was inſerted, and the arm roſe a little, but no eruption whatever appeared. Mr. Sadler, who lives at No. 86, Tottenham-

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* See the obſervations ſubjoined to the tranſlation of Mr. Gimbernat on Hernia.

Fig. 2.

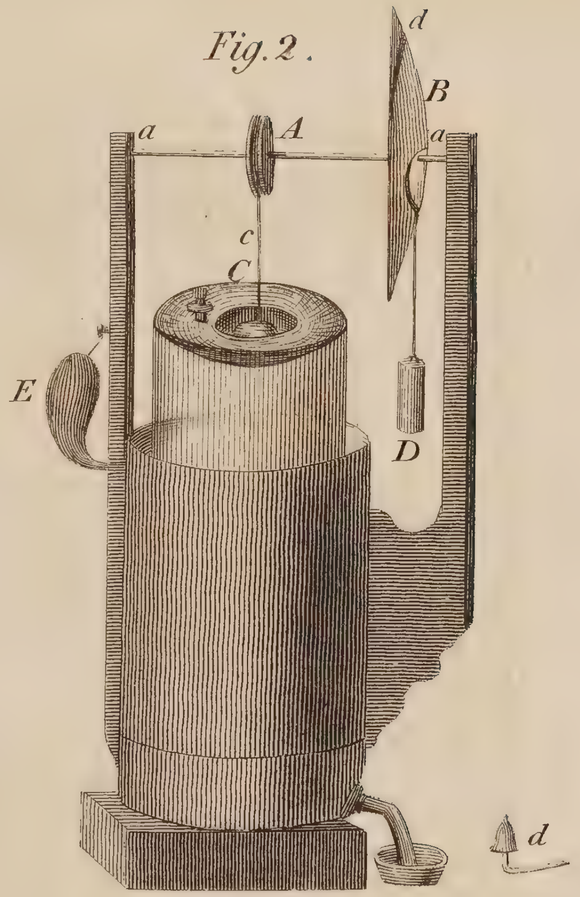
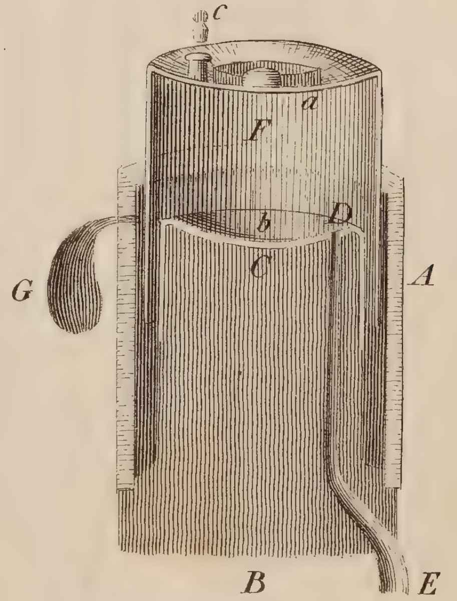


Fig. 1.



Tottenham-court Road, ſeeing the young lady have the diſorder ſo remarkably kind, wiſhed me to inoculate his only child, and I purſued exactly the ſame plan.—No riſing of the arm, or eruption appeared; one day only the little girl complained of head ache. I have alſo had a third example, and no eruption whatever has appeared, or any after-evil, and the little patients have enjoyed uninterrupted health, and they have been expoſed frequently to the infection, without having taken it, which leads me to the perſuaſion, that they are perfectly ſecure, and to hope that *the only objection* againſt *general inoculation* may by an attention to the ſuggeſtions you have given, be at laſt obviated, and the diſeaſe rendered univerſally mild: but this I mention only as a ſuppoſition, to be refuted or confirmed by future experience.

I remain, &c.

R. I. THORNTON.

P. S. Mr. C. Gimbernat informs me that the practitioners in Andaluſia, give *vinegar* to their ſmall-pox patients with the greateſt ſucceſs.

* * *

Description of a MERCURIAL APPARATUS, *suggested by an inspection of Mr. Watt's Machine for producing and containing Factitious Airs, by* Mr. WILLIAM CLAYFIELD, Briſtol.

PLATE III. Fig. 1. repreſents a ſection of the machine, which conſiſts of a lignum vitæ cylinder A. ſcrewed to the ſolid block B. covered at top by the glaſs cap C. having a hole at D for the paſſage of the air through the conducting-pipe E. into the moveable glaſs receiver F.

To an axis turning on the points a a. fig. 2. is adapted the wheel A. of ſuch a diameter, that by the winding of the cord c. in one revolution, the receiver may be raiſed to the ſurface of the mercury. To one end of the ſame axis is fitted the wheel B. over which the balance cord runs in an oppoſite direction in the ſpiral groove d.

Suppoſe the receiver to be loaded with a weight C. ſomething heavier than may be neceſſary to force it through a column of mercury of the ſame depth, and that the balance weight D. equal to the exceſs, hangs from that part of the ſpiral where the radius equals that of the wheel A. and in proportion as the column of mercury forcing up the receiver, diminiſhes during its filling, let the radius of the ſpiral increaſe; ſo that in every ſituation the weight D., may be an exact counterpoiſe to it. As in this way the leaſt poſſible friction will ariſe, plunging the orifice of the tube E. a quarter of an inch below the ſurface of the mercury, contained in a ſeparate veſſel, will be found ſufficient to overcome every reſiſtance, and will force the gas diſcharged from the beak of a retort into the receiver where, whatever may be its quantity, it will ſuſtain a preſſure exactly correſponding with that of the atmoſphere; and by graduating the edge of the wheel the balance cord may be made to indicate its volume.

The convexity at the top of the receiver a. fig 1. fills up the concavity of the cap b. for receiving the fluids it may be thought proper to indroduce, by withdrawing the ground-ſtopper c. and in the ſame way we introduce a lighted taper; or a fluid may be drawn to the cap, by only plunging the orifice of the tube E.

below its ſurface, and then raiſing the cylinder; by cloſing this orifice with the perforated cork and bent tube d. the air may be conveyed from the cylinder to any other veſſel. The gum elaſtic bag at G. fig. 1. is intended to contain the mercury diſplaced by the deſcent of the receiver which may be returned during its riſe, by inſerting it as at E. fig. 2. The joint at the ſcrew muſt be carefully ſecured with thin ſoft leather.

W. C.

CONCLUSION.

THE continuation of my experiments on animals and animal ſubſtances, I find it neceſſary to defer, not having yet provided myſelf with an apparatus accurate enough to determine the quantity and quality of the reſiduary air.—Meanwhile, any perſon may ſee the extraordinary *reddening* effect of hydro-carbonate air, by ſuſpending a ſmall ſlice of veal in a phial filled with this air. Hydro-carbonate air is not decompounded by blood or fleſh ſo as to be rendered more inflammable. On the contrary, hydrogen from zinc is rendered leſs exploſive: whether one or the other is abſorbed remains to be tried.

Numerous trials having been made with airs in medicine, with ſo little detriment, or with ſucceſs ſo conſiderable as to warrant a proſecution of the practice, I have annexed a ſynoptical view of the publiſhed caſes. This view will lead to reflections on the effect of unuſually deep inſpirations ſimply, and of various degrees of dilution of artificial airs. On the ſubject of dilution I have to add the following memorandum from Mr. Watt. It reſpects his letter, p. 34, 35. "Though I

“ mentioned to Dr. Thornton my approbation of di-
“ luting the factitious airs in general, I had no idea of
“ carrying it ſo far as he has done. My notion was,
“ that the airs might be advantageouſly mixed with 30
“ or 40 times as much common air, when they are to
“ be breathed out of a bag; but that in caſes where
“ the air of a room was to be modified by factitious
“ air, the dilution might, and muſt be carried much
“ farther; eſpecially in the uſe of hydro-carbonate, a
“ cubic foot of which will very ſenſibly affect the air
“ of a room 12 feet ſquare and 8 feet high, as I know
“ by experience. I have not tried the effect of oxy-
“ gene air in ſimilar circumſtances, but ſhould expect
“ they would be leſs ſenſible. As I conceive Dr. T.
“ to have been led to ſuch dilution by obſervation as
“ well as theory, I muſt believe his practice to be
“ right. It is by no means my intention to criticiſe it.
“ I only wiſh to explain what I mean by *dilution* in
“ my letter to him.”

August 7, 1795. J. W.

The reader may expect from me ſome general reflections on the effects of airs. But many hundred more obſervations muſt be collected and compared, before a theory can be eſtabliſhed. The *immediate* operation of oxygene is doubtleſs to render the action of the heart and arteries ſtronger. Among its remote effects may be reckoned an increaſe of the red colour of the blood, where this is pale, and heightening of the complexion. The conjecture that it exhauſts leſs than other equal ſtimulants is ſtill undetermined. Other remote effects require further inquiry.

Hydro-carbonate air weakens the action of the arterial ſyſtem while it is reſpired. But ſo would the mere abſtraction of oxygene. *Does the venous blood, changed as it is by hydro-carbonate, stimulate the veins more than the dark blood they usually carry?* Does this air ſtimulate the abſorbents? In conſumption it has been obſerved, (and I have ſeveral times noticed the fact in the laſt ſtage of conſumption) that the expectoration is diminiſhed, when hydro-carbonate is adminiſtered. Perhaps other phœnomena might be brought to ſupport this ſuppoſition. But I ſhall not dwell upon it at preſent. It may not be quite ſo eaſy to determine when the veins are ſtimulated. Dr. Darwin mentions paleneſs as ſometimes a ſign of this.—Leſs ſpungineſs of the gums, may, I ſuppoſe, alſo be regarded as the ſign of a *tonic* effect on the veins; that is, of their action having become permanently ſtronger.

I know not if any anatomiſt has yet thought of employing the rubefacient effects of oxygene or hydro-carbonate air, for aſcertaining the doubtful ſtructure of certain parts. The latter appears very capable of ſuch application; as the blood tinged by this air paſſes beyond the reach of the moſt penetrating injection.

TO WILLIAM REYNOLDS, of *Coalpit Bank*, JOSEPH REYNOLDS, of *Ketley*, and WILLIAM YONGE, of *Shefnal, Shropshire.*

YOU see how far the undertaking, which you so liberally encouraged, has advanced. We all looked for opposition; nor have we been disappointed. But it was hardly to be expected in the shape in which it came from the enraged London Apothecary. Sir Jeremiah's statement of this transaction, I know on the best authority, to be exact. The alternative was offered to one of the patients, whose case you have read above in his own words. As to the young lady, Sir Jeremiah's conjecture was right; she never became the subject of experiment. A few days before her death, her father applied to me in an agony of distress; he inquired if it was possible to assuage her sufferings by any means. But nothing was attempted.

When I write the secret history of the pneumatic practice, I flatter myself I shall afford you some entertainment. Among the Doctors whom high-born patients imagine to opine *with full cognizance of the subject, you will wonder to find one taking oxygene for fixed air, and another for the phlogisticated air of Dr. Priestley. Such is the alliance between intrigue and information. How do you think a surgeon in the metropolis went about to apply fixed air to a cancerous ulcer? I should never have guessed. But I am assured that he held the mouth of the retort, spouting acid foam, to the part. The liquor dropped on the lady's cloaths; the sore set to smart: and how could the poor tortured patient refrain from wondering that there should be in the world people wicked enough to recommend such abominable applications? She did not, I dare say, know that her surgeon might have equally succeeded in burning her gown and increasing her sufferings with his vitriolic acid, even though he had not taken the trouble to work it up into froth with fixed air.*

In spite of such mishaps, aided by the propagation of untruths and the terror of imprisonment, the following reasons persuade me that factitious airs must have a full trial in medicine and surgery. 1. *No body will imagine that all the persons who have transmitted to me their narratives*, could *mistake or* would *misstate their own feelings.* 2. *In different cases of the same disease, the results, whether favourable or unfavourable, are analogous.* 3. *There must be discernment enough out of the profession to enable many persons to perceive that no detriment to the public can result from the inquiry, the trial being perfectly safe with a small portion of prudence and intelligence.* 4. *Men of science abroad have entered with alacrity into the proposal, and foreign academies are offering premiums for an investigation of the virtues of factitious airs.* 5. *That ingenious people, which has nearly conquered leisure for cultivating the arts of humanity, will assuredly not neglect a study so closely allied to the pursuits in which it has already excelled.* 6. *The reports respecting Atwood, Danby, Miss L——, Munt, Mrs. S——, Trayhern, with a variety of asthmatic and phthisical cases, shew that the pneumatic treatment has alone performed or materially promoted the most splendid cures. Now it is evident that the practice is in the most helpless period of its infancy. We scarce know what kinds or combinations of air are best suited to the different stages of different diseases. I do not therefore think, that the facts hitherto observed form any criterion of the merit of the method. Failure should be an incentive to exertion, and partial be regarded as* the *omen of more complete success, in consequence of the improvements which will infallibly suggest themselves.*

If I should publish the secret history, of which I have spoken, would you not advise me to dedicate it to a certain fashionable physician, who has the happiness of being the supreme favourite among fine ladies? Do you think a dedication would be a spell potent enough to confine his tongue within the circle of fact? I am not much inclined to stoop to an exposition of his artifices.

It would be difficult to avoid the imbecility of complaint ; and personalities are always more or less odious. So I believe flattery will be the best resource.—As to minor opponents, were I a wit, it would be as easy to manage them by lampoon as their superiors by dedication. Observe for instance how naturally the apothecary's cool and flowing address runs into rhyme.

YOU *breathe indeed ! do d—mme if you dare,*
Take one ounce measure of their cursed air !
Look, here's your bill—pay that, Sir — if you fail,
You take, by G—d, your next night's air in jail !

T. B.

CLIFTON, SEPT. 14, 1795.

Medical Pneumatic Institution.

Between eight and nine hundred Pounds have been ſubſcribed. The Names of the Subſcribers, except a few which I have not yet learned, are as follow:

ABERGAVENNY Book Club
Alderſon, J. M. D.
Alexander, Diſney, M. D.
Anſtice, Matt.
Armſtrong, Thomas, Surgeon
Aſpinal, A. Eſq.
Banks, Wm. Eſq.
Barnes, Rev. Dr.
Bell, Benj. Surgeon, Edinburgh
Bell, John, Surgeon, ditto
Black, Joſ. M. D. Profeſſor, ditto
Blair, Alex. Eſq.
Boulton, Matt. Eſq.
Boulton, Matt. Rob. Eſq.
Boulton, Miſs
Bowles, Henry, M. D.
Brandrell, Joſeph, M. D.
Brown, G. Eſq.
Brydone, Pat. Eſq.
Calcott, Rev. Mr.
Campbell, W. M. D.
Camplin, Joſeph, M. D.
Capper, W. W. Eſq.
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Chambers, ——, M. D.
Coleman, Edward, Veterinary Profeſſor
Cooper, Aſhley, Mr. Lecturer
Cox, John, M. D.
Congreve, Mrs.
Conſtable, J. Eſq.
Clayfield, Wm. Mr.
Cluni, J. Eſq.
Coates, Wm. Eſq.
Crompton, P. M. D.
Currie, James, M. D. F. R. S.
Dartmouth, Earl of
Darwin, E. M. D.
Darwin, R. W. M. D.
Darwin, E. Eſq.
Davies, D. M. D.
Davies, Mr. Surgeon.
Dearman, T. P.
Dethick, Rev. Mr.
Devonſhire, Ducheſs of
Duncan, Andrew, M. D. Profeſſor, Edinburgh
Dundas, D. Eſq. Royal Sergeant Surgeon
Earl M. Mr.
Edgeworth, L. R. Eſq.
Edgeworth, L. Eſq,
Ewart, John, M. D.
Exon, Rev. Thomas
Eyton, Thomas, Eſq.
Farquahar, Mr. Surgeon
Ferriday, W. Eſq.
Field, Mr. Surgeon
Floyer, Mr. Surgeon
Fox, ——, Eſq.
Forſter, Matt. Eſq.
Francis Mr. N.
French, F. M. D.
Fyfe, Andrew, Surgeon, Lecturer, Edinburgh
Garnham, Rev. R.
Gerard, James, M. D.
Gell, Vice-Admiral
Giddy, Davies, Eſq.
Gill, J. Eſq.
Gilby, W. M. D.
Gimbernat, Antonio, Surgeon
Gimbernat, Carlos
Gregſon, A. Eſq.
Goddington, Mr. J.
Grigby, T. jun. Eſq.
Greene, James, Eſq.
Grieve, B. B. Eſq.
Greive, B. Eſq.
Guillemard, John, Eſq.
Hall, W. Eſq.
Hall, Sir J.
Hall, Major
Hart, T. Eſq.
Hawes, T. M. D.
Henry, T. Mr. Apothecary
Hill, Mr. Surgeon
Hobbes, T. M. D.
Hobhouſe, Benj. Eſq,
Home, James, M. D.
Humberſtone, J. M. D.
Hutton, James, M. D.
Jeffreys, J. Eſq.
Jeffreys, W. Eſq.

Johnſon, Rev. A.
Johnſtone, E. M. D.
Johnſtone, J. M. D.
Johnſtone, J. M. D.
Keir, James, Eſq.
Kellock, A. M. D.
Lady unknown
Lanſdowne, Marquis of
Lewis, Mrs. Sen.
Liptrot, J. Eſq.
Lloyd, Mr. J.
Lloyd, T. Capt. navy
Luard, J. P. Eſq.
Male, T. Eſq.
Manſon, Major
Marſland, Mr. R.
Maſon, ——, Eſq.
Maurice, Thomas, Surgeon
Mead, ——, Eſq.
Middleditch, W. Eſq.
Milnes, Rev. Dr.
Monro, Alex. M. D. Profeſſor, Edinburgh.
Morgan, Mr.
Moleſon, Mr. R. P.
Owen, Robert
Parr, Rev. Sam. D. D.
Pearſon, Richard, M. D.
Pearſon, Mr.
Percival, Thomas, M. D.
Peaſe, Mrs.
Perkins, Rev. Mr.
Perkins, Mrs.
Pew, Rich. Surgeon
Phillips, T. Eſq.
Philpot, H. Eſq.
Potts, Capt.
Powell, Rev. Wm.
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Probyn, Mr.
Proſſer, Mr. Surgeon
Rathbone, W. Mr.
Rankin, D. M. D.
Redfearn, Rich. M. D.
Reynolds, Mr.
Reynolds, W. Mr.
Reynolds, J. Mr.
Roberts, W. M. D.
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Saluſbury, Sir Robert, Bart. M. P.
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Saunders, Miſs
Scott, W. Eſq.
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Seward, ——, M. D.
Sibbit, A. Eſq.
Slaney, Mrs. A.
Smith, Thomas, M. D.
Smith, Mrs.
Sneyds, Mr. and Miſſes
Society, Royal Medical, Edinburgh
Stacey, Rev. H. P.
Strutt, Meſſrs.
Sykes, John, Eſq.
Sykes, Joſeph, Eſq.
Templer, G. Eſq. M. P.
Terry, G. M. D.
Thompſon, Rev. Andrew
Thomſon, ——, M. D.
Thornton, R. I. M. D.
Tobin, J. Eſq.
Townſhend, Rev. Joſ.
Trotter, T. M. D.
Tutin, W. Mr.
Valpy, Rev. Richard, D. D.
Waddington, Benj. Eſq.
Wanſey, George, Eſq.
Watt, Mr.
Watt, Mrs.
Watt, James, Mr.
Waite, W. Eſq.
Wathen, Mr. Surgeon
Wedgewood, late Mr.
Wedgewood, Mrs.
Wedgewood, Miſs
Wedgewood, John, Eſq.
Wedgewood, Joſiah, Eſq.
Wedgewood, Mrs. Joſ.
Wedgewood, T. Eſq.
White, Mr. Surgeon, Mancheſter
White, Rob. M. D.
Williams, ——, Eſq.
Wilkinſon, J. Eſq.
Winwood, J. Eſq.
Wiſe, H. C. Eſq.
Woolley, James, Eſq,
X. Y. Z.
Yonge, Guſtavus, Surgeon
Yonge, W. Surgeon.

ADDITIONAL CASES.

Birmingham, Oct. 9, 1795.

Letter from Mr. BARR, *to* Dr. BEDDOES.

DEAR SIR,

I ANNOUNCE to you with much pleaſure the cure of a caſe of hydrothorax, which had exiſted for a conſiderable time, and notwithſtanding the application of every known and approved remedy, had reduced the ſubject of it nearly to the laſt ſtage of human ſuffering.

Mr. Barbor, of Barton-under-Needwood, being in this town on a viſit to a friend in the ſpring of 1793, was ſeized with an highly inflammatory fever, attended with a violent pain of the ſide. This fever was followed by a dry tickling cough, a ſenſe of tightneſs in breathing, much languor, and a great degree of reſtleſsneſs and anxiety. His bowels felt full, tenſe, and uneaſy; his pulſe intermitted; and he complained that his urine, though nearly in the uſual quantity, did not flow freely, and that he had always the ſenſation of not having evacuated the whole. Bliſters, boluſes of triturated mercury, and a decoction firſt of Peruvian, and afterwards of Auguſtura bark were preſcribed. He was relieved by theſe medicines, but he neither recovered his ſtrength nor his ſpirits. In this ſituation nearly he paſſed the remainder of the year in the country; in the ſpring of 1794, he came to Birmingham again, with all the ſymptoms of his diſorder very much increaſed, particularly the oppreſſion in breathing. He could neither lie down in bed with comfort, nor aſcend the ſmalleſt acclivity without great uneaſineſs. His urine was diminiſhed in quantity and voided with difficulty. A decoction of Seneka root and ſmall doſes of Digitalis were directed and continued for two or three weeks; but they rather ſeemed to amuſe than to relieve him. He called on me again in April laſt, and told me that all medicines had loſt the power of relieving him; that his breathing was more generally difficult, that his urine was very ſcanty, and that his appetite was entirely gone. I preſcribed the Digitalis and a bitter infuſion for him. He went into the country and continued theſe medicines for ſome time. Towards the end of July he called upon me again—but, alas! how changed! His face was now become pale and emaciated, his eyes ſtared as if taking a laſt conſcious view of their object; this circumſtance alarmed his friends exceedingly.—His legs were ſwelled to ſuch a degree that the ſkin was become much inflamed, and in danger of burſting; he had a continual teneſmus, and made very little urine; he could not endure a horizontal poſture for a moment, but was under the neceſſity of being bolſtered upright in bed through the night; even then he ſlept little, and that little was diſturbed and unrefreſhing, for he frequently ſtarted from his ſleep under an impreſſion of inſtant ſuffocation.

I had then ſeen a proof ſheet of your appendix containing an account of the happy relief Sir William Chambers had experienced from oxygene in a ſimilar ſituation; I mentioned it to my patient, and adviſed the adoption of the pneumatic plan; I did this, I confeſs, with little hope of advantage, but as the moſt powerful medicines had produced no ſalutary effect, I felt it my duty to him, as well as to the cauſe of humanity, to urge his compliance. I procured him a reading

ing of the caſe, and the ſimilarity of the circumſtances was ſo ſtriking, that he agreed to come to Birmingham, and place himſelf under my care.

He arrived here on the 12th of Auguſt, and began to inſpire the factitious air on the 13th, I directed one quart of oxygene mixed with nineteen of atmoſpheric air, to be inhaled every day; but as the ſymptoms were become extremely urgent, I thought it right to join the uſe of thoſe active medicines that I had preſcribed for him before. Accordingly I directed him to take half a grain of Digitalis in ſubſtance, every evening, and four ounces of a decoction of Auguſtura bark in the courſe of each day. On the third night after inſpiring he found himſelf more compoſed, he could remain longer in one poſture, and the ſtartings during ſleep, ſeemed both leſs frequent and leſs violent. Every night he was ſenſible of amendment; in ten days he could bear the removal of ſeveral of the pillows that bolſtered him up in bed; and he could ſleep for three or four hours without one ſtarting fit. The ſwellings of his legs too began now to ſubſide; the teneſmus was entirely removed; the quantity of urine was much increaſed, and he could walk up ſtairs with much eaſe; his appetite and cheerfulneſs began to return, and the pale face of diſeaſe to give place to the florid countenance of health. In the courſe of the ſecond week I had gradually increaſed the quantity of oxygene to two quarts a day, diluted as before. In four weeks from his beginning to inſpire the vital air, not a veſtige of the diſorder remained, except weakneſs; he could lay his head as low in bed as when in perfect health, and ſleep the whole night; no ſwelling of the legs remained, no difficulty of breathing upon ordinary exertion, and every function was performed with regularity and eaſe. He then went home provided with oxygene, and directions how to uſe it, and laid aſide the uſe of all medicines except a laxative pill occaſionally. He paſſed through this town yeſterday in perfect health. His ſtrength, agility, and vivacity are greater than in moſt men at his age (60).

This caſe, in my opinion, will add to the credit of pneumatic medicine; for though I employed medicines along with the oxygene, yet let it be remembered that the ſame remedies had been repeatedly taken without advantage, and before the diſorder had made ſuch alarming progreſs; add to this, that during the intermediate periods of the little hiſtory which I have given, Mr. Barbor had conſulted ſome of the ableſt and moſt experienced Phyſicians of the preſent age, and faithfully followed their directions without any material benefit. May we not therefore conclude that the art of medicine had exhauſted all its reſources without effect, and that this Gentleman had remained a devoted victim, had not this new foe to diſeaſe ſtretched forth her benevolent hand and ſnatched him from miſery and death. This is the opinion of the worthy gentleman himſelf, of his family and friends, who have witneſſed the whole proceedings. They have deſired me to make it known to others, that thoſe in ſimilar circumſtances of diſtreſs may be encouraged to hope for eaſe and health.

I am, dear Sir,

Your's very reſpectfully,

JOHN BARR.

Extract of a Letter from Dr. REDFEARN,

To Dr. BEDDOES.

ELIZABETH HOWLET, aged 41 years, has been afflicted with a pituitous aſthma upwards of 16 years; attended with dyſpnœa, troubleſome cough, and a copious expectoration of mucous matter. She is alſo affected with flatulency, loſs of appetite, and has great debility. Her countenance is pale and ſomewhat bloated; her pulſe 100, weak and tremulous; ſhe has often obſerved the extremities of her fingers to become of a livid colour.

On May the 20th, 1795, ſhe began to inhale four quarts of oxygene diluted with eighteen of atmoſpheric air, every evening. The oxygene was gradually increaſed, and during the laſt two months, ſhe has inhaled daily twelve quarts of oxygene mixed with ten of atmoſpheric air. Sometimes ſhe has inhaled a cubic foot of recent oxygene undiluted, without experiencing any bad effects from it. She only mentioned a ſenſation ſimilar to that from drinking pepper mint water, and an agreeable glow in her cheſt, after inhaling this quantity her ſleep was always ſound and undiſturbed with coughing. September 20, ſhe now relinquiſhed the inhalation with much regret, after having uſed it for four months, and found her health much improved during its adminiſtration. The dyſpeptic ſymptoms are entirely removed, and ſhe is now enabled to make her own bed, which ſhe has not been able to do for ten years paſt; ſhe has alſo acquired a degree of corpulency which has ſurpriſed all her friends, and the livid appearance at the extremities of her fingers has totally diſappeared; her cough and expectoration are much mitigated, and her countenance appears more healthy than before, her pulſe is now above 70, natural, and increaſed in vigour, her appetite is very good, and ſhe ſleeps well.

N. B. This caſe by Dr. Redfearn, is not included in the table.

* * *

MANY reports having been ſpread in print and otherwiſe, reſpecting the firſt of Dr. Ewart's cancerous patients, after the period at which his narrative ceaſes, I am tempted to inſert the following piece of authentic intelligence. It may ſerve to ſatisfy curioſity till that more ample account which I hope will be given, ſhall appear. The reader ſhould recollect that the patient led a life the reverſe of temperate. Some of the following expreſſions ſeem to imply irregularity of attendance.

Bowood, Oct. 12, 1795.

DEAR SIR,

" ON my return to Bath, I ſaw the firſt female patient, whoſe large cancerous ulcer of the breaſt was healed, though it returned on leaving off the application of carbonic acid air. The ulcer, however, is not ſo hideous, and *it gives no pain* when ſhe applies the air, which was done in my preſence. I think the whole will be healed up again if the application is continued, as it always grows better when the remedy is uſed. Upon the whole, I think this a very ſtriking caſe to demonſtrate the greateſt efficacy of carbonic acid applied conſtantly, by means of a bladder, to foul ulcers.

I am, &c.

J. INGENHOUSZ."

I am always glad to bring into view the power of carbonic acid air (which is I believe poſſeſſed by ſome other airs) to allay the pain from certain ulcerated ſurfaces. On this fact, joined to the conſideration, that no other method will do as much, I reſt the propriety of the application. The argument muſt convince every underſtanding above idiotiſm ; yet are there many practitioners, whom it will not induce to allow their patients the chance of a reſpite from miſery, not to ſpeak of the chance of cure.

This ſupplemental half-ſheet allows me to announce the fulfilment of a prediction which I lately riſqued, with regard to the progreſs of pneumatic medicine.— In the letter to Mr. Watt, prefixed to the 2d edition of Parts I. and II. of *Conſiderations on factitious airs*, I ſaid, " Sould the purſuit, which I by no means apprehend, be abandoned here, it will be continued in other countries." Mr. Gimbernat, Surgeon to the King of Spain, has the following paragraph in a letter to a friend in England. " The doctrine of the medicinal uſe of factitious airs appears to me to be well eſtabliſhed on the laws of the animal œconomy, and upon the connection which is well known to ſubſiſt between the nature of elaſtic fluids and life : and I think it highly probable that medicine and ſurgery will derive from Dr. Beddoes's diſcovery* conſiderable improvement. Mr. Sobral, the King's firſt Phyſician, to whom I have communicated Dr. Beddoes's ideas, is of the ſame opinion, and in conſequence he has eſtabliſhed a ſmall hoſpital for the

purpoſe

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* Fidelity of tranſcription obliges me to leave this word *diſcovery* as it ſtands in the letter. I diſclaim the merit which it implies. I have only made propoſals and particularly preſſed the uſe of unreſpirable airs.

N. B. The bag mentioned in Mr. Rolph's letter, holds 30 quarts.

Speedily will be published,

A CONCISE

VIEW

OF THE

PROGRESS

OF

Pneumatic Medicine.

TABLE

OF

CASES IN WHICH FACTITIOUS AIRS HAVE BEEN EMPLOYED.

> " Of my own obſervations it was my original determination to relate ſuch only as might inſpire caution . . . . . and to watch effects in the
> " character of an Adverſary."——CONSID. p. 8.

N. B. *A.* means the preſent Pamphlet.
C. The Second Edition of Conſiderations of Factitious Airs, by the Author and Mr. Watt. Johnſon.
Coll. Collection of Letters to the Author. Out of Print.
D. Dr. Ewart on Cancer. Dilly.
G. The Rev. Joſeph Townſend's Guide to Health. Johnſon, Robinſons, Cox.
M. Dr. Ferriar's Medical Hiſtories. Cadell.
M. Ex. Medical Extracts. Johnſon, Robinſons.
L. Letter to Dr. Darwin. Johnſon.
P. Dr. Pearſon's Short Account of Airs. Baldwin.
Z. Dr. Darwin's Zoonomia. Johnſon.

P.N. Patient's Own Narration.
Az. Azotic Air.
C.ac. Carbonic Acid Air.
Hdc. Hydrocarbonate.
Hg. Hydrogen.
Ox. Oxygen.
Dil. Diluted.

Ext. Extremely.
Mod. Moderately.
Lit. Little.
Occaſ. Occaſionally.
Ben. Benefit.
p. Permanent; has continued months.
pp. Very permanent; many months.

AMAUROSIS AND SENSES IMPAIRED.

Name.	*State in other Reſpects.*	*Medicines beſides.*	*What Air.*	*Circumſtances.*	*Reſult as to the Diſeaſe.*	*Authority.*
1. Mr. James Tobin. -	General health, good.	None. - - -	Ox. lit. dil. - -	Leſs chilly in cold weather.	None. - - -	P. N. C. page 79.
2. T. B. - - -	Amauroſis. - -	Veneſect. - -	Ox. mod. dil. afterwards hdc. dil.	Head-ach, reſtleſſneſs; a fit of apoplexy.	None. - - -	Dr. Carmichael, C. 69.
3. Female patient. -	Curious variations of imperfect viſion.	Aperient occaſ. -	Ox. lit. dil. - -	Occaſional blindneſs laſts longer than uſual.	None, - - -	Dr. Carmichael, C. 70.
4. T. Mead. - -	Water on the brain.	Mercury, aperients, and tonics.	Ox. lit. dil. - -	Sight reſtored. -	Ben. great, not p. -	Dr. Thornton, A. 9.
5. A Boy. - -	Deaf; mouth awry.	Tonics. - -	Ox. mod. dil. -	Wry mouth ſet right.	Hears better pp. -	Dr. Thornton, A. 58.
6. Lady. - - -	Sight impaired. -	Tonics. - -	Ox. ext. dil. - -	Health improved.	Sees better pp. -	Dr. Thornton, A. 59.

ANASARCA, GENERAL, AND OF THE LUNGS. ASCITES.

Name.	*State in other Reſpects.*	*Medicines beſides.*	*What Air.*	*Circumſtances.*	*Reſult as to the Diſeaſe.*	*Authority.*
7. Mr. G. l.	Dyſpeptic : free liver.	Digitalis.	Ox. mod. & aft. lit. dil.	Dyſpepſia relieved.	Not cured.	Author, C. 157.
8. Mr. ——	- - - -	Digitalis.	Ox. nearly pure.	No temporary advantage	Not cured.	Dr. Darwin, A. 76.
*8. Mr. Barker.	Free liver.	Many in vain: digitalis.	Ox. mod. dil.	Diſtreſs ſoon removed.	Cure.	Mr. Barr, A. 113.
9. Sir W. Chambers.	Age 75.	Bitters, aperient occaſ.	Ox. ext. dil.	Dyſpnœa removed.	Great ben.	P. N. A. 2.
10. Mary Leucraft.	Aſcites.	Crem. tartar.	Ox. mod. dil.	Complexion heightened.	Cure pp.	S. Hill, Eſq. A. 7.

ASTHMA, AND DYSPNOEA.

11. A Lady.	Spaſm. Fit every four days.	None.	Hg. $\frac{1}{3}$.	Two ſhort fits in two months.	Conſid. ben.	Dr. Ferriar, Vol. II. page 227.
12. J. B——.	Humoral.	None.	Hdc. dil.	Relapſed from imprudence.	Great ben.	Dr. Carmichael, C. 101. A. 82.
13. Mr. ——	Humoral.	- - - -	Ox.	Inhaled but once.	Much eaſe.	Dr. Ferriar, C. 82.
14. Mr. T——.	Humoral.	Tonics in the day, opium at night.	Ox. ext. dil. in the forenoon, and hg. dil. in the evening.	The diſeaſe appeared aggravated ſix weeks by the dil. ox. when exhibited alone.	Cure pp.	Dr. Thornton, C. 77.
15. Lady.	Dyſpnœa.	Tonics. Aperients occaſ.	Ox. mod. dil.	Walks up ſtairs with leſs dyſpnœa after the inhalation.	Imperfect trial.	Dr. Thornton, C. 18.
16. Rev. Dr. ———	Fit every night, ending in expectoration.	Emetics. Aperients occaſ. and tonics.	Ox. ext. dil.	Strength and appetite increaſed.	Cure pp.	Mr. Townſend, G. 398.
17. Mrs. Barrett.	Spaſmodic.	Tonics. Aperients occaſ.	Ox. ext. dil.	Complexion heightened.	Cure pp.	P. N. A. 25.
18. Mr. ——	Humoral.	Tonics.	Ox. ext. dil.	General health eſtabliſhed.	Much ben.	Mrs. Barrett, A. 26.
19. B. Clopton, Eſq.	Spaſmodic.	None.	Ox. ext. dil.	Strength, and ſpirits, improved.	Cure pp.	P. N. A. 48.
20. Mrs. Barker.	Orthopnœa.	Tonics.	Ox. ext. dil.	Cancer leſs indurated.	Cure pp.	Mr. Barker, A. 23.
21. A Lady.	Humoral.	Aperients.	Ox. mod. dil.	Immediate relief.	Cure pp.	Mr. Phipps, A. 70.

Oppoſite ſpecies of air have undoubtedly been ſerviceable in Aſthma. To ſolve this paradox, Dr. Darwin ſupplies the following practical hints (Zoonomia, Vol. II. p. 183—5.). "In *Humoral* Aſthma, in which there is probably accumulated fluid to be abſorbed, and the violent reſpiration is *not* an exertion for the "relief of pain, an atmoſphere with more oxygen is likely to be of immediate advantage. In *Spaſmodic* Aſthma hydrogen has given relief." If hydrocarbonate give tone to the veins and abſorbents, the cure of Humoral Aſthma may then beſt be attempted by a mixed plan; by oxygenated air during the paroxyſms, by hydrocarbonate during the intervals, and perhaps with addition of oxygen; which mixture has not been ſufficiently tried. In a caſe of Humoral Aſthma, now under my care, this plan has done great ſervice.

CHLOROSIS AND SENSIBILITY INCREASED WITH IRRITABILITY (OR CONTRACTILITY) DIMINISHED.

22. B. P.	Chloroſis.	None.	Ox. mod. dil.	Heightened complexion	Relief repeated.	Dr. Carmichael, C. 73. A. 84.
23. Mary Rider.	Chloroſis.	None.	Ox. mod. dil.	Heightened complexion	Much relief.	Dr. Pearſon, C. 74.
24. Miſs L——.	Chloroſis.	Steel.	Ox. pure.	Steel given in vain before.	Cure pp.	Dr. Alderſon, Mr. Lambert, A. 14, 15.
25. Miſs D——.	Chloroſis.	Steel, aloes.	Ox. mod. dil.	Dyſpnœa ſpeedily relieved.	Cure pp.	Mrs. Stephens, A. 72.
26. Miſs L——.	Chloroſis.	- - - -	Ox. dil.	Caſe not detailed.	Cure pp.	Mrs. Stephens, A. 72.
27. Miſs F——.	Head-ach, ophthalmia.	Opium in large doſes.	Ox. mod. dil.	Blood reddened. Sleeps with leſs opium.	Much ben.	Mr. Phipps, A. 71.
28. Miſs H——.	Violent ſpaſms.	None.	Ox. lit. dil.	Immediate relief.	Cure pp.	Mr. Phipps, A. 70. Dr. Thornton, Coll.
29. Mrs S——.	Head-ach from decayed teeth.	None.	Ox. lit. dil.	Animation increaſed.	Great ben.	Dr. Darwin, A. 77.
30. Miſs M——.	Hyſteria. Fits 3 and 4 in a day.	None.	Ox. mod. dil.	Warmth and ſpirits.	Cure pp.	Mr. Townſend, G. V. II.

DYSPEPSIA.

Name.	*State in other Reſpects.*	*Medicines beſides.*	*What Air.*	*Circumſtances.*	*Reſult as to the Diſeaſe.*	*Authority.*
31. Mrs. Benham.	Head-ach.	Tonics.	Ox. ext. dil.	The viſion improved; & dyſpepſia relieved.	Imperfect trial.	P. N. A. 52.
32. Mrs. Broomhall.	Head-ach.	Steel, bark.	Ox. lit. dil.	Great increaſe of ſpirits.	Cure pp.	P. N. A. 53.
33. Mr. Cotterell.	Flatulence & indigeſtion.	Æther, ſteel, water impregnated with C.ac.	Ox. mod. dil.	Increaſed warmth.	Cure pp.	P. N. A. 54.
34. Mrs. J——.	Dyſp. of pregnancy; and convulſive fits.	Æther. Peppermint.	Ox. lit. dil.	Immediate relief.	Imperfect trial.	Dr. Thornton, A. 57.
35. Mr. P——,	Flatulence & vomiting.	Æther.	Ox. mod. dil.	Sickneſs prevented.	Relief.	Mr. Townſend, G. 277.

EPILEPSY.

36. Mr. J. K——.	Frequent fits.	None.	Ox. mod. dil.	Same effects as opium.	Short aggravation.	Coll. Author.
37. Ann Smith.	Organic diſeaſe.	- - - -	Ox. mod. dil.	Spirits raiſed.	Not cured.	Dr. Pearſon, A. 80.

HYPOCHONDRIASIS.

38. Mr. Ruſſel.	Dyſpepſia; and great lowneſs of ſpirits.	Steel, bark, &c.	Ox. mod. dil.	Relapſed when the ox. was at firſt left off, and the ſteel and bark continued.	Cure pp.	Mr. Townſend, G. 293. P. N. A. 55.
39. Mr. Windy.	Amentia, with cold extremities.	Æth. emet. aper. tonics.	Ox. lit. dil.	Warmth after emetics and cathartics.	Ben. great, pp.	Mr. Townſend, A. 29.
40. The Rev. Mr. T——.	Low ſpirits.	Tonics.	Ox. lit. dil.	Spirits raiſed.	Cure pp.	Coll. Dr. Thornton.

PALSY.

41. Mr. Danby.	From lead.	Tonics.	Ox. ext. dil.	General health reſtored.	Ben. great pp.	P. N. A. 31.
*41. Major Brathwaite.	From opium.	Acidulated drinks.	Ox. lit. dil.	Immediate relief.	Cure pp.	P.N. A. 23. M.Ex.638.
42. W. Trayhern.	No uſe of lower limbs.	Some bark and opium.	Ox. mod. dil.	Warmth.	Cure p.	Mr. Rolph, A. 85.

PHTHISICAL CACHEXY, AND PHTHISIS.

43. Mr. B. F——.	Florid hæmoptoe.	None.	Hdc. dil.	Heat in the cheſt removed.	Cure p.	Dr. Redfearn, A. 11.
44. Miſs ——.	Florid.	None.	Hg. pure 1 quart.	Leſs florid; heats removed.	Cure pp.	Dr. Alderſon, A. 16.
45. Maſter Crump *.	Phthiſis far gone.	None.	Hg. $\frac{1}{3}$. $\frac{1}{5}$.	Leſs dyſpnœa.	Not cured.	L. Mr. Crump.
46. Mr. Whitehead *.	Phthiſis confirmed.	- - - -	Hg. $\frac{1}{3}$.	Pulſe reduced.	Imperfect trial.	Dr. Ferriar, V. II. 226.
47. —— Gent.	Laſt ſtage.	Opium. Oil of almonds.	Hg. ext. dil.	Urgent ſymptoms removed.	Not cured.	Coll. Dr. Thornton.
48. r. A *.	Laſt ſtage.	None.	Hdc. dil.	Relief.	Imperfect trial.	Dr. Carmichael, C. 83.
49. S. C *.	Far gone.	Aperient, p. r. n.	Hdc. dil.	Relief.	Imperfect trial.	Dr. Carmichael, C. 85.
50. J. C.	Far gone.	None.	Hdc. dil.	Influenza during convaleſcence.	Cure p.	Dr. Carmichael, C. 87. A.
51. Mrs. P——.	Far gone.	Balſ. of Mecca.	C. ac.	Diſeaſe from impoſthume.	Cure pp.	Dr. Ewart, C. 91.
52. Dr. Crawford.	Far gone.	Tonics. Opium.	Hdc. dil.	Relief at the time of inhalation.	Imperfect trial.	Dr. Thornton, A. 88.
53. B. Knowles.	Phthiſis ?	- - - -	Hg. aft. Hdc.	- - - -	Not cured.	Dr. Ferriar, V. II. 231.
54. Helen Jones.	Laſt ſtage.	None.	Hdc.	- - - -	Not cured.	Dr. Ferriar, V. II. 239.

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* In theſe caſes, circumſtances more or leſs interrupted the exhibition; yet the benefit at one time or other appeared ſo great, that of many poſſible combinations, if any ſhould add but a little to the efficacy of the air, hopes of recovery in ſimilar ſtates might be entertained. Several patients were obſerved to ſleep better after the air. Dr. Pearſon obſerves that æther-vapour eaſes the dyſpnœa of phthiſis.

PNEUMONIA, CROUP, AND CATARRH *.

Name.	*State in other Reſpects.*	*Medicines beſides.*	*What Air.*	*Circumſtances.*	*Reſult as to the Diſeaſe.*	*Authority.*
55. Mrs. S——.	Pneum. firſt day.	None.	Hg. 44 c. i. to atm. 556.	Immed. eaſe.	Cure pp.	Author, L. 48.
56. Maſter Tovey.	Croup.	Aperients.	Az. dil.	Immed. eaſe.	Cure pp.	Mr. Townſend, G. 103.
57. Mr. R. Edgeworth.	Catarrh, ſecond day.	None.	Hg. mod. dil.	Stricture removed.	Cure pp.	P. N. A. 91.
58. R. Stanley.	Catarrh, 1ſt ſtage.	Active.	Hdc. dil.	- - - -	Cure p.	Mr. Barr. A. 74.
59. Mr. T. W. Townſend.	Catarrh, 1ſt ſtage.	Aperient.	Æther-vapour.	Inſtant eaſe.	Cure pp.	P. N. A. 40.
60. Mrs. Eaton.	Influenza, *not* 1ſt ſtage.	Yeaſt. Aperients. Squills.	Az. and C.ac. dil.	Catchings of breath, and pain at the time of inhalation.	Imperfect trial.	Dr. Thornton, A. 66.
61. M. Adams.	Pneumonia, 10th day.	Active.	Hg. $\frac{1}{3}$.	Sickneſs.	Not cured.	Dr. Ferriar, V. II. 237.
62. 2 Patients.	Pneumonia, or phthiſis ?	- - - -	Hg. pure.	Sudden eaſe.	Cure pp.	Dr. Macdonnel, C. 30.
63. 3 Patients, 1ſt ſtage.	Pneumonia.	Evacuants.	Yeaſt.	Produced great eructations.	Cure pp.	Dr. Thornton, A 61.

* Moſt ſerious diſorders in our climate, and in which we may look for great benefit from airs. The pneumatic treatment may, I think, be regulated thus. In and near the firſt or *dry* ſtage (when the abſorbents ſeem to be moſt excited) *hg.* or *az.* ſhould be given. In the laſt, or *moiſt* ſtage, which is very fatal to old people, and dangerous to all where the abſorbents have been debilitated by the preceding inflammation, or by any other previous cauſe, *dil. ox.* ſhould be cautiouſly given: perhaps with *hdc.* alſo. In the intermediate ſtages give *hg.* if you want to abate inflammation; but *ox.* if the function of reſpiration requires aſſiſtance, as in the laſt ſtage with old and weak people, where medicines will do little or nothing.

TYPHUS.

64. Miſs M——.	Laſt ſtage.	Bark, and wine impregnated with C.ac.	Ox. dil.	Inſtant relief.	Cure pp.	Coll. Dr. Thornton.
65. Several Patients.	Typhus, typhoid.	Bark. Water or wine impregnated with C.ac.	Yeaſt.	The progreſs of cure rapid.	Cure pp.	Coll. Mr. Cartwright Dr. Thornton, A. 66. Mr. Townſend, G. 62.

ULCERS CANCEROUS, FOUL, STRUMOUS.

66. Female Patient.	Cancer mammal.	Arſenic.	C. ac. external.	Long free from pain and fever.	Speedy eaſe.	Dr. Ewart, E.
67. Mrs. A——.	Ditto.	Tonics occaſionally.	C. ac. external.	Long free from pain and fever.	Speedy eaſe.	Dr. Ewart, E.
68. Mr. Atwood.	2 large foul ulcers of the leg.	Tonics. Aperients occaſ.	Ox. ext. dil.	General health eſtabliſhed.	Theſe 2 ulcers were filled up and ſkinned over in leſs than a month.	P. N. C. 57. Mr. Townſend, A. 29.
69. J. Patterſon.	Herpes, and large ulcer of the leg.	Tonics. Aperients occaſ.	Ox. mod. dil.	Sight mended.	Cure pp.	Dr. Thornton, C. 64. Mr. Townſend, A. 29.
70. Mrs. Munt.	Ulcer of 18 years ſtanding.	Tonics. Aperients occaſ.	Ox. ext. dil.	Very corpulent.	Cure pp.	Dr. Thornton C. 65. P. N. A.
71. Male Patient.	Strumous ulcer.	Bark.	Ox. and hdc. with ox.	Health mended, caſe in progreſs.	Ben. great.	Mr. Barr, C. 66.
72. Mr. Cooper.	Tumours and ulcers.	Tonics.	Ox. lit. dil.	Spirits increaſed, ſight ſtronger.	Cure pp.	P. N. A. 50.
73. Many Patients.	Scrophulous ſores.	None.	Sorrel poultice.	Redneſs, and pain produced.	Cure pp.	Mr. Mills, C. 48.
74. Many Patients.	Foul ulcers, mortifications.	Pro re natâ.	Charcoal poultice.	Fœtor removed.	Cure pp.	Mr. Sandford, C. 122. A.
75. Mr. Cummings.	Humour in the face of 2 years ſtanding.	Tonics.	Ox. mod. dil.	Comparative trial.	Cure not p.	P. N. A.
76. Many Patients.	Eruptions cutaneous.	None.	Yeaſt.	- - - -	Cure p.	Drs. Johnſtone, Pearſon, Mr. Rolph, Author.
77. Capt. ——.	White ſwelling.	Tonics.	Ox. mod. dil.	General health improved.	Cure p.	Dr. Thornton, A. 21.
78. W. G.	Carbuncular tumours.	Tonics.	Charcoal poultice.	- - - -	Cure p.	Mr. Sandford, A. 94.
79. E. M.	Bad noſe, ſchirrous ?	None.	Charcoal poultice.	- - - -	Cure.	Mr. Sandford, A. 95.

MEDICAL CASES
AND
SPECULATIONS;
INCLUDING
PARTS IV. and V.
OF
CONSIDERATIONS
ON THE
MEDICINAL POWERS,
AND THE
PRODUCTION OF
FACTITIOUS AIRS.

BY
THOMAS BEDDOES, M. D.
AND
JAMES WATT, Engineer.

BRISTOL:
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1796.

TO THE

SUBSCRIBERS

TO HIS PLAN FOR INVESTIGATING THE
VIRTUES OF

ELASTIC FLUIDS,

THESE SHEETS ARE INSCRIBED BY

THE EDITOR;

IN THE HOPE THAT THEIR LIBERALITY
WILL BE THE MEANS OF SECURING AND ENHANCING TO
MANKIND
THOSE BENEFITS,
OF WHICH THE PROSPECT IS HERE HELD OUT.

Clifton, Oct. 26, 1796.

PREFACE.

MEDICINE is an art to which ſome look for health; others for a livelihood. Unleſs the public be ſufficiently enlightened to controul thoſe who exerciſe this art, the latter principle will encroach ſo as to obtain too large a ſhare in determining its condition; and there will always be ſome danger, leſt the advantage of the patient ſhould be ſacrificed to the intereſt, eaſe, or pride of the practitioner.

From the days of Paracelſus, to the full eſtabliſhment of the reputation of the Peruvian bark, there ſubſiſted a conſtant ſtruggle between perſons deſirous of introducing new ſubſtances into medical uſe, and their opponents. Potentates and national councils are well known to have taken an eager part in the diſpute. Phyſicians in poſſeſſion of the public confidence, were almoſt invariably on the ſide of oppoſition; but very ſeldom from certain knowledge or rational belief of the unworthineſs of this or that article to be admitted into the *Materia Medica.*

Controverſies of ſuch a nature appear to be for ever laid aſleep. When a new ſubſtance comes from the Antipodes, if it bring with it a paſſable character, there is now ſcarce a phyſician who will heſitate to receive it into his preſcription, or an apothecary into his ſhop. Had the Editor of theſe communications been content with adviſing the trial of *sal sodae* pills in the caſes of paupers afflicted with calculus; of wood ſorrel for ſcrophulous ſores; and of bodies containing looſely combined oxygene for ſea-ſcurvy, the moſt ſqueamiſh ſon of Hippocrates would never have felt himſelf ſcandalized at his proceedings.

To what is this advance in liberality to be aſcribed? Doubtleſs, in part, to the increaſe of knowledge, and to that habitual reference of opinion to experiment, by which the moſt knowing are kept in modeſt remembrance of their ignorance. But I have ſometimes ſuſpected the agency of an auxiliary cauſe; and the pride of birth having yielded to the ſpirit of commerce, why may not the ſame ſpirit of commerce have contributed to tame the no leſs ſtubborn pride of uſeleſs erudition?

That this ſort of facility extends as far as the LOVE OF GAIN will allow, and very little further, I had ſufficient reaſon to be convinced, long before I found myſelf in a ſituation to meaſure arguments with the enemies to inveſtigation in medicine. If a profit can be got by furniſhing or directing an article, what, among a generation, whoſe ſupreme good is gold---can be more in order, than that there ſhould be at once perſons ready to furniſh and direct? But there may be more trouble than profit in furniſhing the article, or in learning

ing how and when to direct it. In ſuch caſe, what again can be more in order, than for thoſe who are too buſy or too idle to take an intereſt in improvements, to decry it; though they may not chooſe to aſſign preciſely their reaſon for ſo doing?

A critical examination of our ſtores of health would furniſh me with various inſtances for my opinion. I will adduce one. The living body is powerfully affected by heat and cold. But the means we have of applying them, either univerſally or partially, are diſgracefully barbarous in a country, where mechanics and chemiſtry have been carried to ſuch a pitch of perfection. Their clumſineſs, where they are at hand, often deters from their uſe; and ſuch as they are, they are often, in remote ſituations, not to be had. I could point out a variety of ſavage tribes, that have exerted their intelligence and fancy, with admirable effect, on utenſils ſubſervient to their moſt preſſing neceſſities. In civilized communities, the accumulated ſtock of genius and dexterity is applied to no ſuch vulgar purpoſe. It is well if it keep pace with the demands of faſhion. How little the health or welfare of human beings is an object of the arts at large, ſeems ſufficiently proved by obſerving, that the apparatus deſcribed in the different parts of this publication, is probably the firſt conſiderable piece of mechaniſm invented excluſively for the purpoſes of the phyſician. On this ſubject were I to propoſe a queſtion to the moſt unexorable advocate for things as they are, I ſhould not be afraid of a diſſenting anſwer. *Would it be amiss, if, against the exigencies of disease, every pariſh or township were fur-*

niſhed

niſhed with every ſuch inſtrument and convenience as is at preſent known; and with ſuch alſo as human ingenuity, exerted for this expreſs purpoſe, ſhall be able, from time to time, to deviſe? But here is no obvious ſource of profit. The groans of the ſick form no part of the budget; and Miniſters cannot (or perceive not that they can) ſecure themſelves in office by efforts to eaſe the pangs by which thoſe groans are excited. In the mixed maſs, called the public, there are not a ſufficient number of leading individuals aware of the recompence which they might reap in ſelf-approbation, if they would make it a principal purſuit to inform themſelves how their fellow men may be beſt protected againſt perſonal ſuffering; and if they would unremittingly exert themſelves till ſuch protection becomes a ruling principle in ſocial inſtitutions.

I doubt whether the ſtricture was ſincere—but it has been objected to me, that I have written for the general reader, and not merely for the members of the profeſſion to which I belong. I might reply, that without influencing many minds, I could not hope, during the longeſt life, to ſee any ſatisfactory progreſs made in the enquiry which I wiſhed to have ſet on foot without delay. I might add, that although I am perfectly careleſs about the claſs of ſubſtances to which a remedy belongs, there were very ſufficient reaſons for writing more at large, and in a popular manner, when the ſubject was ſo entirely new. The principles on which the trial of gaſſes in medicine ought to proceed, were perhaps not very accurately known to the ſenior part of the faculty; they were nearly as well underſtood out of the profeſſion as in it: and the leſs analogy any method bears to thoſe commonly employed, the more pains will be requiſite to ſatisfy the ſcrupulous of its innocence. I have ſometimes met with invalids ready to ſwallow, upon truſt, in any quantity, medicines with which they were entirely unacquainted; but ſuſpiciouſly inquiſitive as ſoon as gaſſes were mentioned.

But theſe narrow reaſons were not thoſe which had moſt weight with me. I deſired to be inſtrumental in diffuſing a taſte for the moſt uſeful ſpecies of knowledge, and in converting nations into HUMANE SOCIETIES. There is an art, not ſuſpected by the multitude to lurk among poſſibilities, and never yet cultivated by any people, although its honorable title was uſurped by a ſyſtem of intercourſe, once eſtabliſhed among the French. This is the *art of living*; for whoſe reception men's minds can only be prepared, by being familiariſed with juſt ideas concerning animal nature; and whoſe precepts can iſſue only from the ſhrine of Hygeia.

THE DEGREE of credit due to the ſeveral reports in this ſeries and its precurſors every reader muſt determine by his own judgment. I have been anxious to procure unqueſtionable evidence of the groſs reſult. I have always requeſted that the patient might be ſolicited to allow his name and deſignation to appear. Theſe, in my opinion, however, add little to the credibility of a narrative, unleſs the method of treatment be at the ſame time ſpecified. I have omitted no endeavour to procure from the patient himſelf a deſcription of his own feelings; and I have frequently been ſo fortunate as to obtain the atteſtation of a ſecond profeſſional perſon; and of ſuch an one as cannot be imagined to have any ſpecies of intereſt in the favourable iſſue of the proceſs.

With whatever ſeverity the facts be ſcrutinized, it muſt, I think, be admitted, that artificial gaſſes have, by themſelves, been eminently ſerviceable in ſome of the moſt deplorable and moſt hopeleſs of diſorders. I may refer, in proof of my aſſertion, to the firſt of the following reports. In various other inſtances the reſpiration of a modified atmoſphere has probably aſſiſted towards a cure. I am led to think ſo by comparing accounts from different quarters. It ſeems placed, by their concurrence, beyond doubt, that with common care, the adminiſtration of airs is as little hazardous as of any powerful drug whatever. The efficacy of oxygene is not leaſt conſpicuous, where it has moſt diſagreed. I have publiſhed all the facts I could procure of this kind; they will ſerve uſeful admonitions: and is it not to be hoped, that by the ingenious they may be hereafter applied to ſome valuable purpoſe?

In proportion as facts are more eaſily aſcertainable in ſurgery, I feel more confident that the juice of ſorrel will not diſappoint expectation. It is for experiment to give permanent importance to this application.—It however owed its firſt importance to hypotheſis. Had I not been previouſly conſidering the poſſible agency of oxygene in the living ſyſtem, I ſhould never have liſtened with ſo much intereſt to that account of the effects of ſorrel, which obſervation of the frequency of ſcrophulous complaints in the centre of Ireland led me to enquire out. I truſt alſo that charcoal will anſwer to the idea which ſome of my correſpondents have given of its virtues.

Theſe inferences may be queſtioned upon very different grounds. Scepticiſm is ſometimes aſſociated with ardour of enquiry, ſometimes with lethargic ſupineneſs. The following pages will not ſpeedily find a reader more ſyſtematically incredulous than their author. For I ſee not how, without ſincere ſcepticiſm, it is poſſible, in any department, to avoid error: or how without curioſity it is poſſible to attain truth.

As the lazy imbecility of faſhionable phyſicians has ſometimes ſought refuge in ſupine ſcepticiſm, I ſhall quote from a writer of authority, a paſſage in which this diſpoſition is well characterized. It is, univerſally, an object of juſt diſapprobation; but in medicine the public cannot be taught to conſider it with too great abhorrence.

" There are ſome men of narrow views and grovelling
" conceptions, who, without the inſtigation of perſonal
" malice, treat every new attempt as futile and chimerical; and look upon every endeavour to depart from
" the beaten track, as the raſh effort of a warm imagination, or the glittering ſpeculation of an exalted
" mind, that may pleaſe and dazzle for a time, but can
" produce no real or laſting advantage.

" Theſe men value themſelves upon a perpetual ſcepticiſm; - - - - - - - - - - upon inventing arguments
" againſt the ſucceſs of any new undertaking; and, when

" arguments cannot be found, upon treating it with con-
" tempt and ridicule.

" Such have been the moſt formidable enemies of
" the great benefactors of the world; for their notions
" and diſcourſe are ſo agreeable to the lazy, the en-
" vious, and the timorous, that they ſeldom fail of be-
" coming popular, and directing the opinions of man-
" kind."

The diffuſion of philoſophical or experimental truth has, however, very nearly emancipated men from that thraldom under which Dr. Johnſon here repreſents them as labouring. The editor's own experience entitles him to make the remark. And to thoſe whom the mere awe of preſcriptive abſurdity reſtrains from beneficial exertions, it may be encouraging to be told, that the entire want of all thoſe advantages, on which the ſucceſs of phyſicians is uſually calculated, has not deprived him of a large ſhare of public attention and confidence. But, if he had no correſpondent in town or country to conſign him patients; no religious ſect or great man to enrich and degrade him by their patronage; from the younger part of the faculty, and from men of inquiſitive minds, he has experienced perfect good will. This he conſiders, with regard to both parties, as an implied declaration, how unavailing they deem all known means againſt the moſt terrible of our domeſtic evils; and in general, how poor in its pomp they have found medicine.

Hitherto the editor has merely endeavoured to diſcover, in nature and accident, the veſtiges of a path, along which art may proceed to an end which ſhe has never yet reached. He is perfectly ſenſible, that he has brought very little to bear. In putting out of his hands the preſent pamphlet, which he intends as the laſt of the ſeries, he thinks it due to his readers to make this dedeclaration of his pretenſions.

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CASE I.

CAPTAIN HEMSLEY, ætat. 24, commanded a tranſport in the ſervice of Government, which went to the Weſt-Indies with Sir Charles Grey's expedition. The company conſiſted of ſeventeen men and boys, fourteen of whom died from the ravages of the yellow fever. In the month of June, 1795, he was attacked by the ſame fever; but, being ordered to England, the ſhip was re-manned, and during his being ill of the fever the ſhip ſailed. As ſhips, by ſteering to the North, quickly change their climate, it produced ſuch an effect upon him, that his exiſtence was preſerved; it could hardly be termed more: the uſe of the lower limbs was entirely loſt, and the mental faculties were ſo much impaired, as to make his friends deſpair of his recovering either his powers of body or mind. In this ſtate he arrived in England in Auguſt, 1795, and was under the care of the faculty at Goſport for about ſix weeks. After ineffectually uſing every means recommended by them, they adviſed his father to take him to Bath, inſtead of which he put him on board a veſſel, and brought him to Sunderland. In the beginning of December, 1795, his father brought him to Newcaſtle, to ſee if the uſe of the Vapour Bath would render him any ſervice: his ſituation on his arrival here was nearly as above ſtated; his feet and legs were conſiderably ſwelled from extravaſated lymph, and the knees contracted from the rigidity of the flexor tendons—theſe parts felt below the ordinary temperature of his body, and were very inſenſible to the touch. Mr. Abbs, with whom I have the honour to be connected in buſineſs, agreed with me in thinking that the Vapour Bath might be of uſe, at leaſt in procuring a relaxation of the rigid tendons; accordingly we ordered him to uſe the bath three times a week: this he continued for a month, from which he found conſiderable relief—the ſwellings of the feet diſappearing—and the tendons relaxing, ſo as to allow every ſpecies of motion; but ſtill there was no recovery of voluntary motion, nor any additional power. We gave him calomel in ſmall doſes; but ſo ſmall a quantity affected his mouth, that he received little or no benefit from its uſe. The bath having performed its duty, by increaſing the activity of the abſorbents, and reſtoring flexibility to the joints, not being attended with any further beneficial effects, was deſiſted from, and the uſe of tonics, both general and local, were had recourſe to; partial bathing to the feet, ſtimulant liniments, and electricity, wine, bark, and ſteel—theſe had an apparent good effect for ſome days, and then their power ſeemed to ceaſe; we therefore thought of giving the oxygene gas. This being mentioned to a medical friend (Dr. Ramſay), he coincided in the opinion; accordingly, on the 1ſt of February, 1796, he took two quarts of oxygene, diluted with eighteen of atmoſpheric air. After drawing in half a dozen inſpirations,

tions, he found a glow ſpreading over the whole ſurface of the lungs, and ſaid he felt as if going to break into a ſweat upon the neck and cheſt. As that part of the nervous ſyſtem which retained its power, ſeemed poſſeſſed of great mobility, might not this ſenſation ariſe from ſympathy of the external with the internal ſurface, as we ſometimes obſerve ſuch conſent between the ſtomach and the ſkin? The ſenſe of heat continued for about a quarter of an hour, and he felt nothing more from this doſe: it was repeated every morning, with his expreſſing nearly the ſame ſenſations. On the fourth morning his urine was much loaded, and depoſited a copious ſediment, of a reddiſh flaky matter, reſembling brick duſt. Sixth day; ſays he thinks his legs lighter, i. e. in lifting up either of his legs, which he does by putting both his hands round his thigh above the knee, he uſes leſs exertion, therefore we hope he has more power of motion in the leg: he has for ſome years been ſubject to a ſcorbutic eruption upon his face, which ſince his taking the gas is rather better, and appears drying with brawny ſcales. Eighth day, deſcribes the ſenſation he feels from the circulation of the blood in his leg, which he ſays ſometimes ſtops ſuddenly, and then ruſhes on again: he deſcribes the circulation ſo accurately, that the internal coats of the veſſels appear to give him the ſenſations which he expreſſes. Does not this plainly ſhew that the blood in its paſſage through the lungs, under the influence of a highly oxygenated atmoſphere, receives an increaſed degree of vitality, which it ſlowly unfolds to the other parts of the ſyſtem?

The attendants about him obſerve a great change in his conduct; for though a ſailor, he ſeemed to want the fortitude that claſs of men are generally poſſeſſed of,—

nor had he that degree of jocularity, but at preſent his ſpirits are much better. Tenth day, the glow continues longer—nearly half an hour; the circulating ſenſation continues, and is much more frequent; his ſpirits increaſe, and he ſays he feels ſuch a change in himſelf that he begins to have hopes of recovery.—Fourteenth day, he gathers ſtrength of body, and his mind partakes, from the ſame cauſe, a greater degree of energy; his memory is much more perfect, and his anſwers are given with ſuch a degree of quickneſs, in compariſon with his manner previous to the taking the gas, that he ſcarce appears the ſame individual.—Sixteenth day, the urine has ceaſed to depoſit, and as his ſtrength encreaſes, the ſympathetic effect upon the ſkin gradually decreaſes,—he is now enabled to ſtand with the aſſiſtance of crutches and his back ſupported againſt the wall. From being ſo long (ſeven months) accuſtomed to lie in bed, and ſit on low ſeats, when ſtanding erect, his head ſwims like a man upon a precipice, unuſed to ſuch ſituations.—Eighteenth day, his ſtrength increaſes in his limbs, and his vertigo not ſo conſiderable; can take a few ſteps ſideways upon his crutches, and his back againſt the wall.—Twentieth day, recovers daily—ventures a few ſteps from the wall upon his crutches; when his ſtockings are off, his toes are perceived to have a weak voluntary motion; his face continues the ſame, and his ſpirits remain good. Twenty-third day, continues to improve—can get off his chair alone, and walks about his room on crutches—expreſſes a great deſire to be allowed to come down ſtairs, in which he is indulged; it is the firſt time ſince he has been here, which is between two and three months—ſeems highly delighted with the change, as he expreſſes himſelf, he feels he gets better every hour;—the gas in the ſame quantity (2 quarts to 18) is ſtill continued.—

Twenty-eighth day, the weather being fine, he is allowed to walk in the garden; the muſcular fibre which was very much relaxed, has greatly recovered its tone—particularly the calves of the legs, which were ſo ſoft as more to reſemble bags of oil than muſcular fibres, are now poſſeſſed of that tenſion which beſpeaks health and ſtrength. March 3d. continues to improve, except that his feet and legs are a little ſtuffed in an evening; as the Vapour Bath, previous to the uſe of the gas, took away the œdema from the legs, he is to uſe it again. March 6th. Since he was in the bath his legs have not been ſo much ſwelled—in every reſpect continues to improve—the pulſe has not been mentioned in this caſe, though it was attended to, but in a chronic caſe it ſeemed a little neceſſary; it will be ſufficient to remark, that at the time of beginning the uſe of the oxygene, his pulſe was about 100 ſtrokes in a minute, low, and weak; that immediately upon his taking the firſt doſe of gas, his pulſe beat from 8 to 10 ſtrokes in a minute ſlower, and appeared a little more expanded; in the courſe of an hour or two it returned to the uſual ſtandard, with this difference, that as he gathers ſtrength the immediate effect is not ſo great, and that now the uſual ſtate of the pulſe inſtead of being from 100 to 110, is only from 80 to 90. March 10. Continues to get better—can now walk for ſome time in the garden upon his crutch.—March 15. He now uſes a great deal more exerciſe; complains of a numbneſs of the right hand arm. On inveſtigation, this appears to have ariſen from his remaining longer than uſual upon his crutches, which were not ſufficiently ſtuffed to prevent the compreſſion upon the brachial nerve, and the large veſſels of the arm.—March 20. From removing the cauſe of his numbneſs, the effect has ceaſed; continues the gas, which is now increaſed to three quarts.—April 9. No bad ſymptoms ariſing from the continued uſe of the gas, and as at preſent he appears ſtationary, it is thought adviſable to give the ſame doſe twice a day.—April 20. The increaſed doſe ſeems to have been of conſiderable uſe—has made more progreſs; he can now walk with the aſſiſtance of two ſticks —is in great ſpirits—entertains no doubt of getting well. May 6. Is now ſo well, and the ſeaſon ſo fine, that we have adviſed his father, who lives by the ſea, to take him home for the benefit of ſea-bathing, which we hope will perfectly reſtore him.

Extract of a letter (incloſing the preceding Case), from MR. KENTISH, *Surgeon, Newcastle upon Tyne.*

SIR,

I likewiſe incloſe a letter from my friend Dr. Ramſay of whoſe attendance and adviſe I profited during the whole of the caſe. I wiſhed his teſtimony as well as my own, for we are ſometimes led to be too partial, where we are anxious for ſucceſs. This firſt eſſay has induced the faculty of the Infirmary here to order an Apparatus; and, as my partner (Mr. Abbs) is the ſenior ſurgeon, I ſhall have an opportunity of ſeeing its effects in ſurgical caſes. Several, related both in the 1ſt, 2d, and 3d parts of your Conſiderations, would induce us to hope for conſiderable aid from it. When I am further acquainted with the reſult, I will inform you of it, when I hope to have ſome more obſervations to communicate. I ſhall hope to hear of your receipt of this; and I have the honour to be,

Sir, your obedient humble ſervant,

Newcastle, June 6, 1796.

J. KENTISH.

CASE

Letter from DR. RAMSAY.

SIR,

IT gives me pleaſure to have an opportunity of adding my teſtimony to Mr. Kentiſh's, of the efficacy of oxygene gas, in the caſe of Mr. Hemſly.

I ſaw the patient after the fruitleſs adminiſtration of the remedies enumerated, and was aſked whether he appeared a proper ſubject for a *first trial* of Pneumatic Medicine here. Anxious for a trial under leſs unfavourable circumſtances, I heſitated for a while. Hopeleſs however as the patient's ſituation ſeemed to be, I at length approved of the attempt, as failure could not leſſen my confidence in its general utility; and aware that ſucceſs in this inſtance would to others afford proof indubitable of its efficacy.

The caſe as drawn up by Mr. K. preſents a faithful and accurate ſtate of facts. The conjunction of cauſe and effect, that is, the adminiſtration of the remedy and amendment, has ſeldom appeared more diſtinctly in the employment of any medicine in any diſeaſe than in the preſent inſtance. The zeal which Mr. K. has uniformly ſhewn for the advancement of medicine, and his readineſs in adopting every means that promiſe to promote that end, entitle him to the thanks of every friend to ſcience.

I am, Sir,
Your very humble ſervant,
JOHN RAMSAY.

Newcastle upon Tyne,
June 10, 1796.

To Dr. Beddoes.

CASES II, III, IV, V.

OF

EPILEPSY.

Case II. *is reprinted, with some alterations, from a pamphlet entitled,* 'Letters from Dr. Withering, *and other Correspondents*;' *which pamphlet is now out of print, and not likely to be re-published. The fact I think too curious to be lost; and if, with Cases* III *and* IV. *in which oxygene air was also prejudicial, it should serve to enlarge our knowledge of a disease always so terrible, and often so hopeless, there will be little reason to regret the untoward effects produced by oxygene, which were very transitory; and what if by the rule of false, we should arrive at a successful method of treating some of those cases, in which oxygene aggravates the fits or brings them on?*

CASE II.

ABOUT three years ago, a perſon, aged 20, took an excurſion on the mountains of Switzerland. In the night he dreamed of falling from a precipice, and was ſeized, as appeared from ſevere bruiſes on his hands, with a ſtrong convulſion fit. Valerian and other medicines, called *nervous*, were adminiſtered. Sea-bathing diſagreed with him; and after cold-bathing in freſh water his fits ſuddenly increaſed from one or two in a week, to 28 in 24 hours. On diſcontinuing the cold bath, they diminiſhed in frequency, and have not, for a long time, exceeded 12 in the day and night.

The fits differ greatly in violence. The more violent, which he terms *stomach fits*, render him inſenſible;

and continue from one to three minutes; and he is torpid for about ten minutes afterwards. Theſe fits occur only in the night. The ſlighter fits alſo occur more frequently in the night. He will often be attacked but once or twice in the day, and eight or ten times in the night. Theſe ſlighter fits loſt from 10 to 15 ſeconds; the patient being quite ſenſible, and frequently ſpeaking with perfect knowledge of what is paſſing, though indiſtinctly. The inſtant they are over he is quite well or rather relieved. If ſeized, when on his legs, he falls with force; and of his muſcles, ſome become rigid, ſome convulſed. On his chair, he may have a fit without the knowledge of a ſtranger, ſitting in the ſame room. For a long time he was continually drowſy, and a fit was brought on by looking up to any height, or down from it, as alſo by the ſmalleſt effort of attention, even by reading a ſingle line. But none of theſe circumſtances now affect him. His appetite and ſpirits he has always retained; and his faculties are ſaid not to be impaired.

A celebrated phyſician attempted to ſtop his fits by large doſes of opium adminiſtered towards evening and during the night. But the firſt two grains produced a frantic paroxyſm, during which eight perſons were neceſſary to ſecure the patient. This ſtate laſted 18 hours, all which time there was no fit, but during the ſubſequent debility, they were more ſevere than uſual. The ſame remedy was tried a ſecond time, under circumſtances ſomewhat different. The effect and the nature of the malady are thus ſtated by the practitioner, who preſcribed it:—The patient "ſeldom ſleeps more than an hour without experiencing a convulſive fit, which ceaſes in about half a minute without any ſubſequent torpor.—

Large doſes of opium only prevented the paroxyſms, ſo long as they prevented him from ſleeping by the intoxication which they induced. Other medicines had no effect on him. He was gently awakened every half hour for one night, but without good effect, as he ſoon ſlept again; and the fits returned at about the ſame periods of time, for the accumulated ſenſorial power, which occaſioned the increaſed ſenſibility to pain, was not thus exhauſted."

It having been ſuggeſted that modified air poſſibly might be uſeful, I could only ſay that I hoped we could manage ſo as to do no permanent miſchief, but I could by no means vouch that the patient ſhould not experience ſome temporary inconvenience. The wiſh to be relieved from ſo diſtreſſing and helpleſs a condition overbalanced this apprehenſion.

The phyſician, whoſe words I have juſt quoted, thought of a reduced atmoſphere as moſt proper to be tried firſt. But I was induced by falſe analogies to try oxygene diluted with common air. The patient inſpired a mixture of three parts of the latter with one of oxygene, for ten minutes at going to bed. As I then uſed Mendip manganeſe, the quantity of oxygene muſt be conſidered as leſs than the numbers would otherwiſe imply, becauſe that manganeſe yields much azotic gas at the *end* of the proceſs, and becauſe the carbonic acid, which the calcareous ſpar it contains, was not probably all waſhed away. No effect being obſervable, next night (Saturday night) he was deſired to reſpire for 20 minutes; afterwards he felt an agreeable glow in his cheſt. On Monday night, at three intervals, he reſpired for half an hour. I ordered him now a ſaline draught with 20 drops of antimonial wine; and I requeſted that he would drink three glaſſes of wine inſtead of four, which was his uſual quantity. On Tueſday night he reſpired for 20 minutes. On Wedneſday the air was omitted by way of precaution. On Thurſday, as no ſuſpicious effect appeared, and as he paſſed good nights, and for two of theſe days had no fits, he was ordered a mixture of oxygene one part, atmoſpheric air two parts; and of this he reſpired for half an hour, and felt uncomfortably hot afterwards. In the morning his pulſe was 72, and of natural ſtrength. He coughed ſlightly, but found himſelf very well. He had no fit all Friday. A relation who had watched him with great tenderneſs ever ſince the commencement of his indipoſition, thought him better, and wrote a favourable account to his diſtant friends. Towards night the patient was unuſually lively, but quite compoſed in intellect. The reſpiration of factitious gas was omitted, as I had originally determined to wait the event as ſoon as any diſtinct change ſhould have taken place. He had ſcarce lain down in bed when he was alarmed with ſtartings of the abdominal muſcles, as I imagined from his deſcription. This had ceaſed before my arrival, but I found him fluſhed and with a pulſe rather ſtrong, and above 100. He had a conſtant propenſity to motion, but was eaſily perſuaded to exert himſelf to keep ſtill. As he was never left alone, I was quite certain that he had taken no ſtimulant. His wine had been dropped this day. He appeared however as if at once a little intoxicated and alarmed. A ſlight fit now intervened, and increaſed his apprehenſions, for he had begun to flatter himſelf that this would prove the criſis of his complaint. As he had no evacuation all day, a gentle cathartic was given, and ſoon operated properly. In the night he had a frantic attack, ſimilar to that which opium had produced the firſt time; only far milder, and accompanied with ſingular agitations of the muſcles, which was a new circumſtance. His lower extremities were frequently in action, and his toes would move, like the fingers of a perſon playing on the harpſichord. Sometimes, as he was ſitting on his bed, he would lift up his feet, and ſet to revolve; and, looking at me and his relation, he would ſay, with a countenance ſuch as that with which a ſchoolboy, apprehenſive of undeſerved puniſhment, regards his maſter, *Indeed, I cannot help it!* But his moſt conſtant movement was that of his arms; and it was very curious, exactly imitating the geſtures of a perſon driving a phæton; to which the patient had been long accuſtomed every morning, but had diſcontinued it for a few days. Theſe geſtures continued frequent till Monday. He declared that he could not reſtrain them; and at breakfaſt on Monday, when he was quite ſedate, ſeemed rather amuſed with his own inability in this reſpect. For the firſt 24 hours he had only five or ſix ſlighter fits; but then he had no reſt till Saturday night; when he fell into a profound ſleep, and had the uſual number of fits of both kinds, with a paroxyſm of phrenzy early on Sunday morning. On Monday, before day-break, he had a ſimilar, but fainter paroxyſm, which was the laſt. During the reſt of Sunday night he ſlept very profoundly, as he had alſo done in the day-time. At this period the muſcular agitations were principally confined to the fingers,

He was left ſtiff and ſore, as from ſevere exerciſe: the pulſe ſoon became weak. From Friday to Sunday-night he was full of fear, except when torpid: and what is remarkable, not only was the prevailing ſtate of mind the ſame as during the action of the opium, but he was

haunted

haunted by the very ſame apprehenſion of having been poiſoned. The whole effect of the opium, I was told, laſted on its firſt exhibition, about 40 hours; that of the oxygene, which was far leſs violent, continued 12 hours longer; and the extraordinary play of the muſcles was peculiar to the latter occaſion. Indeed during ſleep it continued juſt perceptible for ſome time afterwards, as the ſame relation, who watched the patient a whole night, diſcovered; and he had reaſon to believe, that the ſame apprehenſions which he expreſſed during his excitement, infeſted his dreams. Theſe efforts, which never produced any diſturbance, ſubſided; and the patient became juſt what he was before reſpiring oxygene.

* * *

Extract of a Letter on EPILEPSY.

July 10, 1796.
Bennet-ſtreet, St. James's.

DEAR SIR,

IT is the duty of Phyſicians, who wiſh the improvement of medicine, as well to relate their want of ſucceſs, as thoſe caſes in which their remedies have ſucceeded, in order that experience may diſcloſe what we ſhould purſue, and what avoid.

CASE III.

Miſs N—— was ſubject to epileptic fits. She had been under the care of Dr. Turton, and other eminent phyſicians; and, when her caſe was referred to me, ſhe had no appetite, frequent borborygmi, paleneſs, and coldneſs of the inferior extremities, with often conſiderable heat of the ſuperior and frequent fluſhings. What aſtoniſhed many was, that ſhe poſſeſſed the complexion of a perſon in health. The vital air, in a moderate doſe, was tried; and, though this young lady had not had an epileptic fit (ſhe was, however, ſubject to faintings three or four times in a day) for ſome months, ſhe was immediately after the inhalation ſeized with an attack. For ſome minutes this amiable lady remained torpid; then ſhe violently ſtruggled with convulſive motions of the legs, and ſometimes of the arms, overcoming the ſtrength of her attendants. She at laſt grew delirious; pointed to a particular ſpot in the room; roamed in her imagination; her eyes wide glaring, and fixed: ſhe then attempted to bite her attendants; and, after paſſing three hours in this dreadful ſtate, the hyſteric ball having gradually ſubſided, ſhe fetched a deep ſigh, and recovered, perfectly unconſcious of what had paſſed. But ſhe now was unable to walk, felt a violent head-ach, and went to bed. The next day, as was uſual, ſhe had loſt her voice. In conſequence of this attack, the vital air was deſiſted from for a week; during which time ſhe had no return of the hyſteric epilepſy: but, not conceiving at that time, that ſuch an effect could ariſe from one application only of the ſuperoxygenated air, reckoning it as an accidental occurrence, I urged another trial; but the effect was exactly the ſame. I then ordered an emetic; and was ſurpriſed to obſerve the quantity of *ropy ſlime* that was caſt from the ſtomach. That night was paſſed free from a hecking cough: the next day ſhe was not troubled with headach, was chearful, and the lower extremities were leſs cold.

CASE IV.

In another caſe of epilepſy, Miſs L—— inhaled the vital air, and felt an immediate determination to the head; which fulneſs continued throughout the day, threatening a return of her uſual complaint. Reaſoning now on this caſe, I conjectured that, as the *aorta deſcendens* paſſes between the ſlips of the diaphragm, and this muſcle partakes of the ſame nerve as the ſtomach, it ſeemed probable, that when this viſcus was loaded with mucus, a ſpaſm or ſpaſms of the diaphragm might ſucceed, compreſſing betwixt its two crura the aorta: hence the difference of the appearance and feeling of the upper from the lower parts of the body. The loſs of voice, the globus hyſtericus, and the rabies, which frequently attend theſe fits, ſeem alſo to prove the ſame ſympathy; as the recurrent nerve, which ſupplies the throat, is a branch alſo of the *par vagum.*

CASE V.

After theſe unſucceſsful trials, Mrs. Paynter, who lives at No. 2, Brompton-terrace, came to conſult me. She had been ſubject to hyſterics, faintings, and epileptic fits, for more than ſeven years. She had no appetite, weak digeſtion, exceſſive debility, coldneſs of the lower extremities, flatulence, emaciation, diſturbed dreams. palpitations of the heart, and great lowneſs of ſpirits, Having premiſed an emetic and cathartic, and cleared away the ſuperabundant mucus of the primæ viæ, I then gave the vital air; and the accelerated blood meeting with no obſtruction in the aorta, now diffuſed heat through the whole ſyſtem. To prevent the glands, or exhalant arteries, of theſe parts, from throwing out too much mucus, I next gave tonics, as bark, myrrh, and ſteel ; and, by uſing occaſional evacuations, continuing the daily inhalation of the vital air, after ten days the fits no longer made their appearance, and her appetite, complexion, and ſleep returned ; and at the end of ſix weeks her conſtitution was ſo firmly eſtabliſhed, as to need no more medicine or air.

I am, &c.

R. J. THORNTON.

To Dr. Beddoes.

CASE VI.

MELANCHOLIA.

Letter from Dr. CRAWFORD.

July 13, 1796.
Caſtle-ſtreet, Holborn.

SIR,

MY greatly reſpected friend, Dr. Thornton, at my ſolicitation, undertook to afford his aſſiſtance to Mr. W——. The caſe of that unhappy young man, as related in a letter addreſſed to you, which the Doctor has ſhewn me, is perfectly correct. The firſt time he inhaled the vital air, the effect was truly ſurpriſing. He threw himſelf into a number of groteſque attitudes, remaining ſtiff in each he aſſumed, ſimilar to what appears in catalepſy; nor changing them, unleſs urged to motion. A dawn of reaſon ſoon after diſcloſed itſelf by ſeveral acts which were conſiſtent, and plainly evinced rational deſign. The inſtances noticed by Dr. Thornton form only a very ſmall part of the different occupations in which he engaged; and from which the moſt ſanguine hopes were formed of his being ſhortly reſtored to the full uſe of his intellects. It was with real grief his family, and all who were concerned in the management of him, obſerved, that as he advanced in the recovery of ſenſe, he increaſed in obſtinacy: and in a very ſhort time, no plan that could be deviſed was capable of prevailing upon, or obliging, him to continue the inhalation of the vital air. Here his friends ſincerely joined me in lamenting, that pneumatic medicine was not yet ſufficiently advanced, to render the exhibition of it to ſuch a patient practicable. Were rooms provided, according to the plan you have propoſed, patients of Mr. W——'s deſcription placed in them, by having alone ſuperoxygenated air to inſpire,

might

might be aſſured of deriving from it all the benefit it is capable of producing. From the good effects which attended the ſmall portion he made uſe of, there is every reaſon to believe, that if it could have been adminiſtered in adequate quantity, the tear of ſorrow would have been long ſince wiped from the cheek of an unhappy wife, a protector would have been reſtored to infant children, who neceſſarily want his parental guidance; and cheerfulneſs would have been reſumed in a family, which has been too long ſuffering the moſt oppreſſive grief.

I am,

Sir, &c.

JOHN CRAWFORD.

To Dr. Beddoes.

Extract of a Letter from DR. THORNTON, *on Melancholia.*

July 12, 1796.
Bennet-ſtreet, St. James's.

Mr. W——, married, aged 28, having two children, the ſon of a gentleman of extraordinary powers of mind, and himſelf once the pride of his acquaintance, for the laſt two years has exhibited the moſt melancholy picture of human nature. He neither, during this long period, opened his eyes or ſpoke: he would remain, for hours, in one poſture, with his head towards the ground, collecting the ſaliva, which guſhed from his mouth; and, unconſcious of all the decencies of life, he was commonly as loathſome as he was pitiable. His hands, feet, and face, were icy cold: his bones were abſolutely through his ſkin; which of courſe was broken into numerous ſores. As he had no voluntary movement, to prevent him from ſtarving, food was put into his mouth; which was then cloſed, with his noſtrils, with the hand; and, in the ſtruggle of ſuffocation, ſome might be got down, but wholly unmaſticated. Under ſuch forlorn circumſtances, in the preſence of his phyſician, Dr. Crawford, I adminiſtered the vital air; and, to the great ſurpriſe of all preſent, after the inhalation, for more than a quarter of an hour, he reeled about the room, like one intoxicated with wine, and ſometimes ſtiffened like a ſtatue; and, when this ſtrange paroxyſm was over, he knelt down, and took Dr. Crawford by the hand, which he kiſſed, ſhewing ſigns of thankfulneſs and gratitude: and, though for the laſt two years he had been dreſſed like a child, the next morning he was obſerved to dreſs himſelf completely. I gave Mr. W—— the vital air the next day following; when he had many contortions of his face, his mouth being ſeveral times drawn awry. I then, in concert with Dr. Crawford, ordered an emetic and cathartic; and, after this evacuation, the vital air only diffuſed a glow over his whole body. The journal which I keep of my patients, diſcloſes the progreſs of the caſe; and I ſhall ſelect the alterations as they were produced. Firſt, through the operation of emetics, at the interval of ſix or ſeven days, and aloetic pills in the evening, and a tonic in the day of bark, myrrh, and ſteel, with the inhalation of vital air, warmth of the whole body was conſtantly kept up; he ſwallowed his ſaliva; then he took to chew his victuals; digeſtion now going on, with keen appetite, he grew fat, and the ulcers healed, and his cadaverous countenance was changed into the appearance of health: his reaſon alſo gradually returned, as was manifeſt by many little incidents. One day, being ordered to bathe his feet in warm water, as his attendant was out, he choſe to carry up the pail for the maid. The next day, my ſervant having brought up the coal-ſcoop, and laying it down in a hurry, he took it up, orderly raked the fire, and put on the coals. I ſhall relate but one other incident. His father having returned home fatigued, it being duſk, and aſking for a glaſs of wine, he took up the bottle, and held it to the light; and, perceiving it was Port wine, which his father ſeldom drinks, he laid it down, and then taking up the white wine, he poured him out a glaſs. He ſoon obſerved all the decencies of life; he ſat up at table with the family; would occaſionally converſe; and not unfrequently open his eyes. As he grew more rational, his diſpoſition manifeſted the moſt ſtubborn obſtinacy, and his art was ſuch, as finally to elude every method which was tried to make him inhale the vital air. It was in conſequence deſiſted from, and I continued the other medicines, with the addition of the electric bath; which reſembles a garden-box in ſhape, with a ſeat, the inſide being coated with about ſixty ſquare feet of tin foil; which was inſulated, and connected with an electrical machine of great magnitude, and of a new conſtruction. This ſeemed to be of uſe; at leaſt the benefits above related continued in a great degree; and even the ſervant, as well as myſelf, knew exactly when the emetic was wanted, by the loſs of animal heat, and melancholia, which was as conſtantly removed, when the ſuperabundant mucus was diſcharged from the ſtomach.

OBSERVATIONS

ON

THE PRECEDING CASES,

BY

THE EDITOR.

OBSERVATIONS.

ALL medical knowledge is undoubtedly founded upon the obſervation and compariſon of caſes. Nevertheleſs, reports of the moſt unimpeachable fidelity ſometimes tend very little to advance the art, and not at all the ſcience, of medicine. Let me ſuppoſe that a phyſician undertakes to inſtitute an impartial compariſon between the efficacy of errhines, of warmth externally, of æther, of arſenic, valerian, emetics, and other articles of the Materia Medica, in head-ache; and that he gives in numbers the reſult of an extenſive experience. If the public were not beforehand in poſſeſſion of a ſufficient number of groſs obſervations, which may be multiplied at very ſmall expence of thought, the labours of our practitioner will ſhew that by trying theſe remedies one after another, we may hope ſometimes to effect a cure. His figures alſo may afford ſome help in judging with which remedy to begin. This information has its value, and deſerves to be thankfully accepted, till better can be had. But it belongs to ſcience to ſort facts, to detect their reſemblance and diſcrepancy, to teach why one remedy ſucceeds better than another in two complaints of the ſame denomination, and why, in ſome inſtances, all fail. A few obſervations, arranged according to their natural affinities, are more valuable than an infinity of undiſtinguiſhed facts; though collections of mere un-analyzed facts, are often preſented with the utmoſt good faith, and not ſeldom accepted with the utmoſt good nature, as the only guides to ſolid practice in medicine. Such authors and ſuch readers, little ſenſible perhaps of the advantage of diſcovering principles, are heard perpetually to decry ſpeculation. But their diſapprobation has ſmall effect in retarding ſcience.— The utility of juſt theory encourages ſucceſſive attempts, and the difficulty of aſcertaining cauſes is an excuſe for failure.

Theſe reflections will I hope juſtify me in endeavouring to explain the chief circumſtances in the foregoing remarkable caſes. However they may differ in ſome reſpects, they ſeem to me to preſent certain phenomena capable of illuſtrating one another.

In the firſt paralytic patient, oxygene appears to have reſtored irritability to the red muſcles of locomotion. But the abſorbents, which may be ſuppoſed alſo to be muſcular, though of a ſomewhat different conſtruction, did not equally, or did not at all, recover their power. In R. G.'s caſe of anaſarca of the lungs, which I have related at p. 164, of *Conſiderations, part* 1. *edit.* 3*d.* I was diſappointed in the effects of oxygene gas. Dr. Darwin, *Conſiderations, part* 3. experienced the ſame compleat failure. In Sir W. Chambers it ſeemed in ſome way to ſuſpend the dropſical ſymptoms, and in Mr. Barbor it had pretty manifeſtly the effect of rendering the abſorbents ſuſceptible of a ſtimulus, which did not act upon them before. In the preſent caſe we have a clear diſtinction of great curioſity, and of great practical importance too. From its immediate and permanent effects, *oxygene muſt have ſpecifically acted upon the arteries, and probably upon the locomotive muſcles*; and what is extraordinary, while theſe parts were recovering their healthy functions, the abſorbents of the extremities were becoming weaker. This direct ſpecific power of oxygene

gene is confirmed by the caſes of Danby and Trayhern. The origin of the defect of voluntary power over the muſcles, in theſe three caſes, requires attention. In the preſent caſe, was it from contagion or cold? Trayhern's palſy was, I think, evidently the ſequel of rheumatiſm. In Danby it was the effect of lead.

In theſe well-atteſted inſtances, the efficacy of the gas ſeems palpable, and they bear to one another the teſtimony of analogy. For although Trayhern at firſt took ſome of the medicines entitled *tonic*, experience does not warrant us in aſcribing the reſtoration of his muſcular power to their agency. The recovery of ſenſibility, mentioned in Mr. Kentiſh's inſtructive report, I conſider as a ſecondary effect of ſome ſpecies; perhaps ariſing from the excitation of the brain by the more ſtimulating blood.

The motions, cauſed by oxygene in the caſes of epilepſy and melancholia, are ſcarce leſs remote from the courſe of ordinary appearances than thoſe occaſioned by the application of metals to denuded nerves. Galvani himſelf could hardly have been more aſtoniſhed than myſelf and the other ſpectators of my epileptic patient, as muſt be ſenſible to any one who ſhall be at pains to follow my account in imagination. The phenomena, however, I imagine to be perfectly capable of a ſatisfactory elucidation, which I ſhall now attempt.

Pathology is on no account more indebted to the author of Zoonomia, than for the light which he has thrown upon the obſcure origin of convulſive diſeaſes. I do not indeed believe that every twitching of a ſingle muſcle, or of a ſingle bundle of fibres, is an effort to relieve pain. Theſe leſs conſiderable diſeaſed actions I impute to irritation; and it is to me probable that the limbs are occaſionally ſtimulated into convulſive ſtartings. If the nerves be conductors of the power of the brain, or, if (as ſome of Dr. Valli's experiments lead to conjecture) they themſelves are in any degree a ſource of the *vis vitæ*, they muſt, it ſhould ſeem, like other conſtituent parts of the ſyſtem, be liable to a diſeaſed condition. And a greater derivation of nervous power to any muſcle or part of a muſcle, would increaſe its excitability ſo as to occaſion it to contract from its ordinary ſtate of mere extenſion without any other ſtimulation: and is it impoſſible that electricity ſpontaneouſly generated in parts, ſhould excite partial contractions by irritation? The late experiments on animal electricity have ſhewn that the nerves with their muſcles are the moſt delicate of all electrometers. If theſe remarks be juſt, it will follow, although the deficiency is indeed unimportant, that in Claſs I. of Zoonomia, Part II. there is wanting a genus for irritative convulſions. But with regard to ſpaſmodic and convulſive motions, conſtituting dangerous and obſtinate diſeaſes, I am obliged, after much doubt and inquiry, to acknowledge that they are juſtly aſcribed to painful or uneaſy ſenſation, producing morbid voluntary action.

By an undoubted law of the animal œconomy muſcular exertion is employed without deliberation, for the relief of pain. Wherever I have been able to trace epilepſy to its firſt fit, I have found it diſtinctly preceded by diſtreſſing or diſagreeable feelings; and though they may be very obſcure in certain examples, they figure, in elementary authors, among the chief occaſional cauſes of epilepſy. In Caſe II. the frightful dream, excited by the tremendous ſcenery beheld the preceding day, and followed by the firſt fit, furniſhes a combination of events, that cannot eſcape the moſt careleſs reader. And the relief ſo conſtantly ſaid to be afforded by the ſlighter fits, deſerves to be pointed out as a curious confirmation of this doctrine, for thoſe fits being ſhort and not attended with any conſiderable convulſions, they muſt be regarded as relieving diſagreeable ſenſation, without much exhauſting the living power of the ſyſtem, which is ſeen to ſuffer ſo exceſſively when the voluntary muſcles are agitated by long or violent contractions. Theſe ſlighter fits, I was told, were often attended by ſome diſcharge of air; a particular that deſerves notice, ſince the fits might have ſometimes ariſen from a torpor of the ſtomach or bowels, during which the air was generated and lodged in the inteſtines.

The very ſlight incidents and exertions, which after the aggravation of the diſorder by cold bathing, brought on the paroxyſms, mark the caſe as peculiar in the degree of ſuſceptibility. I have never myſelf ſeen a patient equally ſuſceptible, except a young perſon, who having become cataleptic (probably from being the ſubject of a trick at ſchool), had for ſome time a paroxyſm, whenever the feet were moved from the bed or ſopha, ſo as to be dependent. Theſe examples of fits from ſlight ſubſequent occaſions, are apparently analogous to the intoxication and purging, which are ſaid to be producible by trifling quantities of alcohol and opium, or aloes, in perſons who have begun with enough of theſe articles to enſure the effect, and afterwards gradually leſſened the doſe.

At thoſe times, when the diſagreeable ideas aſſociated with the ſight of a precipice, or the diſagreeable ſenſations occaſioned by the exertion of reading, were followed by an acceſſion of epilepſy, the ſyſtem being in its ordinary ſtate, the ſpaſms and convulſions were of the uſual kind. The motions, occaſioned by the exhibition of oxygene, betray a ſpecific power in the cauſe. They were not the effect of apprehenſion from reſpiring the air, otherwiſe they would, it ſhould ſeem, have taken place in much leſs time than a week; and they would doubtleſs have been of one or other of the two ſpecies, which differed ſo remarkably in ſeverity by reaſon of the accumulation of excitability during ſleep. It remains, therefore, that all the muſcles, rendered unuſually ſuſceptible of motion, were ready to fall into convulſions, in conſequence of the ſmalleſt ungrateful ſenſation.

When debilitating powers aggravate epilepſy, they do it by increaſing the ſenſibility of the ſyſtem. Thus the preſent patient was permanently worſe after cold bathing, as alſo for a ſhort time, while the ſecondary effect of opium laſted. That the oxygene cauſed general excitement, appeared both by the ſtate of the pulſe, which was nearly ſuch as is obſerved in inflammatory diſeaſes, and from the phrenzy fits.

If in caſes III. and IV. an unpleaſant ſenſation was experienced, that would be followed by averſion and by a fit, without any particular power poſſeſſed by oxygene. A ſenſe of fulneſs in the head is conſequent upon greater efforts of reſpiration than common; and, provided it could have been done conſiſtently with prudence and humanity, it would have been deſirable to try, whether the ſame effect would have followed the reſpiration of atmoſpheric air in the ſame manner, the patient not knowing what air he was breathing in the comparative experiment. A cautious reaſoner, without pronouncing it impoſſible, will heſitate before he aſcribes a fit of epilepſy to the immediate peculiar agency of oxygene in ſmall quantity, and, as I ſuppoſe, very largely diluted.

Although I have been more circumſtantial in developing theſe phænomena than the ſagacious phyſiologiſt may deem neceſſary, I ſhall ſtill beſtow a few reflections upon the caſe of Melancholia. The ſpaſms and convulſions, ſucceeding the exhibition of oxygene air, afford a curious example of the affinity between inſanity and convulſion *(Zoonomia* II. p. 354, *and elſewhere)*; as alſo does Caſe II. in which opium or oxygene produced tranſient inſanity. In the preſent inſtance, we may conclude, that no ſuch reciprocation had taken place before; otherwiſe the patient's friends would not have failed to inform the phyſicians. From the ſucceſſion of events, therefore, and the analogy of the preceding caſes, the new and ſingular motions muſt have been owing to a new condition, directly or indirectly ſuperinduced by the reſpired oxygene. Whether this conſiſt in increaſed irritability from addition of oxygene to the muſcular fibres, or in ſome effect of altered blood in the arteries that traverſe the body of the muſcle, is a queſtion not yet decided, nor perhaps eaſy to decide. It ſeems certain, that the power which had been expended on painful trains of ideas, was now derived to the muſcles; which may be ſaid to have invited it, by being rendered more contractile; and that thus the melancholy trains of ideas, which even parental affection had not power to prevent, were interrupted. At the ſame time, the action of the arterial ſyſtem undergoing ſome change, or I ſuppoſe becoming ſtronger, a degree of agreeable ſenſation was introduced, and certain ſurrounding objects were noticed with pleaſure, as happens in incipient intoxication.

The practical inferences to be deduced from this melancholic caſe, and the three firſt epileptic caſes, are, in my opinion, directly oppoſite. Where formidable convulſions already exiſt, it ſeems obvious that no cauſe ſhould be applied which renders the muſcles more ready to be thrown into morbid action. But the propriety of making certain epileptic patients ſleep in an atmoſphere with leſs oxygene, which had already been propoſed upon analogical grounds, is very ſtrongly confirmed by theſe ſeveral concurring facts. The patients, who would reap moſt advantage from this expedient, I apprehend would be thoſe whoſe acceſſions are moſt frequent or ſevere in their ſleep; and if they were young perſons of *ſanguine* temperaments and *plethoric* habits, as they have been termed, they would ſtand a ſtill greater chance of being benefited by a reduced atmoſphere.

In bad caſes of melancholy madneſs, the riſk of exciting ſome degree of convulſion may reaſonably be run; and it may be proper to ſupport and vary by opium, adminiſtered during the intervals, and alſo by the warm bath, the pleaſureable ſenſations occaſioned by oxygene.

The viſcid mucus, ſo commonly noticed in caſes of inſanity, I ſuppoſe to be in itſelf inoffenſive; and occaſional emetics ſeem uſeful, not by eliminating this matter, but by changing that condition of the ſtomach, by which it is produced, and which is accompanied with great torpor of moſt other parts of the ſyſtem, except perhaps thoſe employed about the diſtreſſing ideas.

To theſe reaſonings I ſhall ſubjoin a ſhort account of two illuſtrative caſes. I owe the firſt to a phyſician in my neighbourhood; and think, that as cauſe and effect ſeemed palpable even to the patient, it may be uſeful by reminding thoſe whom it may concern, of the propriety of making the neceſſary inquiries in ſimilar circumſtances.

" In the latter end of the year 1794, I attended a
" young perſon who was ill of an aſthma. She was un-
" expectedly attacked with epilepſy. The fits returned
" frequently in the day, and almoſt every day for ſeve-
" ral months. For a length of time, notwithſtanding
" the ſtricteſt enquiry, no cauſe, apparently ſufficient to
" produce theſe effects, could be diſcovered. At laſt,
" excruciating pains in making water overcame the par-
" ticular falſe delicacy, and obliged her to diſcloſe their
" ſource, which was an acrid diſcharge, excoriating the
" vagina, proceeding from a diſeaſed uterus."

This is a good example of the origin of epilepſy. I have elſewhere mentioned, in general terms, that I had obſerved ſtricture induced, and rendered tighter in aſthma, by the reſpiration of diluted oxygene gas. This has occurred in two caſes. One was in a gentleman who for many years had not paſſed 24 hours without a fit, and whoſe heart had become dilated before I ſaw him. His was among the very firſt caſes in which I ever directed the exhibition of airs. The dilapidated ſtate of his health rendered me exceſſively ſuſpicious. It was evident on ſeveral trials, that oxygene, which I had taken care to dilute largely, brought on difficult breathing and ſtricture immediately. The patient deſired me to proceed till I had ſatisfied myſelf. I was convinced, that no increaſed effort of inſpiration, or other mechanical circumſtance, produced the bad effect, becauſe it did not take place with hydrogene gas diluted. I loſt ſight of the patient before I could give this method a proper trial.

The other was the caſe of a perſon, above twenty, weak from rapid growth, and who had been long ſubject to nervous head-ache and daily fits of extremely difficult breathing, with ſtricture, which did not terminate in expectoration. There were circumſtances in which the caſe was different from common ſpaſmodic aſthma. The patient was conſtantly obliged to ſit quite erect; if, in ſleep, this poſture was changed, awaking in diſtreſs was the conſequence. The moſt ſtrict enquiry did not give reaſon to ſuppoſe water in the cheſt. After a three-week's courſe of oxygene, in the proportion of one, two, three, and once five quarts, to 30 of atmoſpheric, the patient and the phyſician became reluctantly convinced, that ſome increaſe of the tightneſs of the cheſt was produced by it.

It appears, therefore, that when a habit of ſpaſmodic and convulſive actions has taken place, they will in ſome caſes be renewed and aggravated, in conſequence of ſome change this ſubſtance produces in the muſcles. The ſame thing appears in Caſe II. with reſpect to deliberate voluntary motions. Long habit had given the muſcles, employed in driving an open carriage, a tendency to act together and in ſucceſſion; and this, added to the propenſity, acquired from the gas, produced the geſtures that occupied ſo much of the time between Friday and Monday morning.

There are, however, circumſtances in which the cure of ſpaſms and convulſions is the conſequence of reſpiring oxygene; as is evident from the caſes where aſthma has been mitigated, or has diſappeared, under the daily uſe of oxygene for months; and from a very remarkable caſe of ſpaſmodic ſeizures, apparently affecting the diaphragm, in which opium, largely adminiſtered, having loſt its effect, oxygene was given with complete and permanent ſucceſs. The firſt part of this hiſtory is given in the *Collection of Letters*, p. 36. Of the reſult I have been informed by letter from the patient's friends, who are perſons of much eminence in the medical world.

What theſe circumſtances are, I have not been able preciſely to determine. But, if ever an exact catalogue of them all be made out, they will, I believe, be found referable to one or other of the two following laws.

1. OXYGENE SOMETIMES, BY RESTORING THE ACTIVITY OF A LANGUID PART, REMOVES THE SENSATION THAT OCCASIONS THE CONVULSIVE EFFORTS, AND SOMETIMES—*(see this exemplified on a principle somewhat different, in the case of head-ache, related by Dr. Darwin, in Considerations, Part III.)*—BY DIMINISHING SENSIBILITY, OR GIVING GENERAL ENERGY TO THE SYSTEM, DESTROYS HABITS OF MORBID ACTION.

2. WHEN IT PRODUCES NEITHER OF THESE EFFECTS, IT AGGRAVATES SPASMODIC AND CONVULSIVE COMPLAINTS.

AMONG the authors who flouriſhed in the period between the appearance of the Chemiſts or Anti-Galeniſts, and that of the more modern ſyſtematic writers of the Continent, there are ſome that may ſeem to have entertained ideas on the origin of convulſion, ſimilar to thoſe of Dr. Darwin.

Their expreſſions were probably ſuggeſted by Van Helmont's reveries concerning his Archeus. The Stahlians will be thought to approach ſtill nearer to the ſame theory. The two following paſſages from Sauvages (Clas. iv. Ord. iv. 19) will illuſtrate theſe remarks.

Motus muſcularis, ait Sennertus, *nunquam fit citra appetitum aut rationalem, aut sensitivum; cum itaque voluntas seu appetitus rationalis non jubeat motum, illum* a cupiditate ſeu appetitu ſenſitivo JUBERI *manifestum est.*

Again. *Quae in corpore vivente fiunt operationes ab anima ejusque facultatibus proveniunt, unde hos etiam inordinatos motus naturam ſolam excitare extra dubitationis aleam est* (Schneider. de Epilepſia).....*Cauſa (epilepsiae). Acerrimum facultatis naturalis expultricis, contra molestias irritantes, in universo musculorum genere excitatum certamen. (Idem.)*

Notwithſtanding ſuch a degree of reſemblance in expreſſion, it is probable that a diligent ſcrutiny would evince a wide difference between preceding authors and our contemporary, with regard to the principle itſelf, the phaenomena connected by it, and its practical application. An enquiry into the difference or coincidence might be curious. But, inſtead of entering into it, I ſhall lay before the reader a piece of information, which will prove ſatisfactory to him, very nearly in proportion to his benevolence, and to the intereſt he may take in the advancement of uſeful knowledge.

Letter from Mr. KENTISH.

Newcastle, Aug. 12, 1796.

SIR,

I SHOULD have acknowledged the receipt of your obliging letter ſome time ago, had I not waited to ſend you the ſequel of the caſe; which, from my former account, would appear unfiniſhed, and might not receive the credit it merits from uncandid readers, or thoſe prejudiced againſt the pneumatic practice. I ſaw Captain Helmſley a few days ago, which is the firſt time ſince I ſent you the report. He has not taken any medicine ſince he left us, and has regularly purſued the riding and walking exerciſe recommended. His recovery has been progreſſive; and I have at preſent the inexpreſſible pleaſure of aſſuring you, that I ſaw him walk without the aid of either ſtick, crutch, or any aſſiſtance whatever. In ſhort, when I reflect upon the helpleſs, nay, hopeleſs ſituation he was in when he came to Newcaſtle, with every probable appearance of his remaining ſo during the remainder of his exiſtence (for he had gone through ſeveral ordeals of medicine) I find terms inadequate to expreſs my thanks to thoſe who have placed ſuch means in my power. On further inveſtigation, I find, by ſome of his acquaintance, that the eruption of his face is attributed to the too free uſe of liquors. Should we, on further trial, find that oxygene gas is of uſe to reſtore *power* to a ſyſtem, which has been excited to too great action by free living; which conſiſts in general of ſubſtances highly hydrogenated, it will be invaluable; for we find moſt of the diſeaſes of the preſent day to be of this claſs —for few are the orders of Society who do not live above par. In a caſe of dropſy I have given oxygene gas; at firſt the effects were very ſalutary, increaſing the ſecretions by the ſkin and kidneys; but, from the impatience of the young gentleman, who wiſhed to be well at once, he increaſed the doſe, ſo much that he excited a ſhort dry cough, which obliged him to abſtain from its uſe: thus depriving himſelf of the benefit that was likely to have ariſen from its uſe, and drawing an unfavourable concluſion, from his being obliged, through prudence, to give it over. I thank you for the hint reſpecting the purity of the oxygene air. I have tried what I have made with nitrous gas, and find it equal to that obtained from the red oxyd of mercury; and, by putting quick lime into the refrigeratory, and uſing the agitator, I keep it very free from carbonic acid gas. I ſometimes uſe Monſieur Seguin's method, of trying its purityby inflaming phoſphorus in the gas over mercury. It is mentioned in the Annales de Chymie. In one caſe in the Hoſpital here, oxygene gas has been of uſe internally, given for the cure of an ill-conditioned ulcer. A fermenting cataplaſm was uſed at the ſame time. I have no doubt, when impartially viewed, that great benefit muſt accrue from its uſe in Hoſpitals, as the atmoſphere in them is generally below par in reſpect to oxygene gas.

I have had an opportunity of paying conſiderable attention to a ſpecies of accident very common among colliers in this part of the country: viz. burns from the exploſion of hydrogene gas in the mines. The little information to be got from authors, and the contradictory applications they recommend, has made me think and act for myſelf in the treatment of them; in which, at preſent, I hope I have eſtabliſhed one or two principles, which may be of uſe to be known. I purpoſe giving a comparative view of different modes, illuſtrated by caſes under my own inſpection: as I am induced to think it is the want of this compariſon that makes the treatment ſo indeciſive.

I am, dear Sir,

With the greateſt reſpect,

Your's ſincerely,

E. KENTISH.

To Dr. Beddoes.

CASES

OF

ASTHMA, SPASMODIC AFFECTIONS,

CHLOROSIS,

AND

OTHER DISEASES OF DEBILITY,

In which Oxygene Air was used.

CASE VII.

Note from JAMES HARE, *Esq. M. P.*

I WILLINGLY conſent to publiſh my caſe, in hopes that other perſons may obtain relief from ſimilar treatment. For near eleven years I have been ſubject to frequent attacks of nervous aſthma, under which I ſuffered inexpreſſibly. Bliſters on the cheſt, with expectorant medicines, uſually relieved me, though not till after many hours of agony. I was troubled with this diſorder more in damp than in froſty weather. If I caught cold, I ſcarcely ever eſcaped it. My ſtrength and ſpirits were very much affected for a long time after the difficulty of breathing had left me. About the middle of September laſt (1795) I began to take oxygene air, by the advice and under the direction of Dr. Beddoes. In a few weeks there was a ſenſible and viſible improvement in my general health. Towards the end of October I caught cold, and had a pretty ſevere fit of aſthma, though much leſs ſo than many former ones. From that time to the preſent I have only had five attacks, all ſlight in degree and ſhort in duration. For many years paſt I have ſuffered much from illneſs in the ſpring; but this ſpring I have not been confined for one hour; and, during the whole ten months I have enjoyed a much better ſtate of health than for many preceding years. Hot rooms and damp weather affect me much leſs than formerly; and I have caught cold ſeveral times without its bringing on an aſthmatic fit. Having taken the oxygene air once a day (with few interruptions) for about nine months, the beginning of this month I diſcontinued it;

in hopes that I may go through the ſummer without its aid, and ſo reſerve it for future exigencies.

J. HARE.

Conduit-ſtreet,
July 29, 1796.

A Letter from Mr. PHIPPS, *Surgeon and Oculiſt in Ordinary to his Majeſty—on Aſthma. Cases* VIII. IX.

Pall-Mall, Auguſt 8, 1796.

SIR,

Mr. Stepney having mentioned to me that a ſervant who attended him had been afflicted with a ſpaſmodic aſthma above thirty years, I recommended him to place him under the care of ſome perſon in the habit of adminiſtering factitious airs. Accordingly he did ſo. He was ordered a more generous mode of living; and whenever his diſeaſe has threatened an approach, it has been invariably put off by inhalation of vital air. During the laſt eight months, he has had but two paroxyſms, which were ſo ſlight as not to confine him to his bed, as heretofore; and I ſhould add that his ſon, who, upwards of ſeven years, had conſtant dyſpnœa, with frequent ſpaſmodic attacks of aſthma, was alſo cured four months ago by the ſame remedy in ſeven days, and when I ſaw him lately he was blooming, and in perfect health.

I remain, Sir, &c.

J. W. PHIPPS.

To Dr. Beddoes.

SPASMODIC *or* ASTHMATIC SEIZURE *of the* DIAPHRAGM. *Case* X.

Letter from the same.

Dear Sir,

I have juſt received a letter containing a requeſt of yours, that I would ſend a particular account of the caſe of a young lady who had been cured of violent ſpaſms in the ſide, by means of oxygene air. I heartily wiſh it were in my power to do it with more minuteneſs, but I kept no journal of the caſe. The lady had for nearly three years prior to her inhaling the oxygene, been afflicted with ſpaſms in her ſide, and indeed, thro' the whole extent of the diaphragm, which appeared to me the immediate ſeat of the complaint. For the firſt two years, they were not conſtant and only ſlight, very bearable, and eaſily removed by a few drops of laudanum. During the laſt year, they encreaſed (I believe from mental anxiety) to a degree truly terrific. She was now *never* totally free from pain; and generally morning and evening the ſpaſms became ſo dreadful, that I cannot find words to convey an idea of them. They would continue half an hour, one, two, three, and even ſix and eight hours. Laudanum to the quantity of three hundred drops produced no other effect, than to render her perfectly delirious. Her breath was alſo at this time ſo much affected, that ſhe could not go up or down ſtairs, without reſting every few ſteps, and panting to a degree that was frightful. In this ſtate during the ſpaſm) ſhe firſt breathed oxygen air, in the proportion of about three pints to twelve or fourteen of atmoſpheric air, and it almoſt inſtantaneouſly removed the ſpaſm. This ſame effect was generally obtained, and there were two and even three days ſometimes together during which ſhe had no ſtrong ſpaſm. Nor do I think, after the firſt week of inhaling the oxygene, they ever returned with the ſame degree of violence. I found it neceſſary however to encreaſe the quantity of oxygene to about ſix pints to the ſame proportion of atmoſpheric air. Thus I gave it conſtantly at the commencement of the ſpaſm, and always with effect; ſometimes complete, and ſometimes only ſo far ſucceſsful as to render the ſpaſm bearable. After about three months there was a conſiderable amendment, the ſpaſms were ſlight and leſs frequent. She ſoon after married, and had not the leaſt return for a year and a half; at the end of that period ſhe had ſome ſpaſmodic feelings, but they were ſlight, and of ſhort duration: ſince (that is for above a year) ſhe has been perfectly well. Theſe I believe are the leading features of the caſe, and I only wiſh I could have tranſmitted them to you with greater particularity. I have this morning ſeen the lad I mentioned in my laſt, as cured of aſthma, he has had no return whatever, and it is now more than three months ſince he left off the vital air, which he inhaled for ſix weeks. I have only to add, that

I am, Your's, &c.

J. W. PHIPPS.

N. B. A phyſician, who had been conſulted in this caſe, in a letter of a date ſubſequent to that of Mr. Phipps, writes that the lady "now enjoys robuſt health."

ASTHMA.

ASTHMA. *Case* XI.

Letter from Mr Baynton, Surgeon, of Bristol.

Mrs. ——, aged 32, corpulent, and of fair complexion, had been in the habit of miſcarrying, at about the third or ſixth month of pregnancy, for eight or ten years previous to January, 1795, when, after an obſtinate cough, which had effected her the greateſt part of the preceding Autumn and Winter months, ſhe was attacked on the 16th in the evening by a complaint that very much reſembled the paroxyſm of ſpaſmodic aſthma, except that it was much more violent than firſt attacks of that diſeaſe uſually are, and that its remiſſion was attended with a very copious diſcharge of frothy ſerum from the bronchial tubes, which was thrown up by a ſlight, tho' almoſt continual cough. A large doſe of opium was immediately given, a bliſter applied to the cheſt, and a mixture compoſed of oxym ſcil, gum ammon and pure water, directed to be taken every ſix hours. The 17th ſhe was much better; the anodyne was repeated at bed-time, and, as the cough was ſtill troubleſome, ſaline draughts, with camphorated tincture of opium, were directed in lieu of the mixture. Her cough ſoon became better, and the Summer was paſſed over without much inconvenience, by the aſſiſtance of occaſional opiates, open air, and cool acidulated draughts of water. On the 27th of September ſhe was again attacked ſomewhat violently. An opening mixture, a bliſter, and occaſional anodynes, were again had recourſe to, with apparent good effect. On the 4th of October another bliſter was applied to the ſternum, the ſquill pills were preſcribed, and the opiate repeated. From that time till the 3d of January, 1796, ſhe went on without experiencing any material alteration, but not without the occaſional aſſiſtance of medicines of the kind above mentioned. On that day ſhe was attacked with hyſteria, and was relieved by the bark, after the bowels had been emptied by an opening medicine. On the 23d of April, after experiencing much depreſſion of ſpirits and coldneſs of her feet, ſhe became affected with a numbneſs of the left ſide; the muſcles alſo on that ſide of her face were drawn upwards, and ſhe talked ſo indiſtinctly that her friends were ſometimes at a loſs to underſtand her meaning. Her bowels and pulſe were in a natural ſtate, and her mind very much depreſſed. She had a pain over one of her eyes, and was very drowſy. The bark was again had recourſe to, and the fœtid gums directed to be taken in the uſual doſe and manner. From that time until the 23d of the enſuing month (May) ſhe continued to take medicines of a ſimilar kind, with but little good effect. On that morning, about five o'clock, after having had a good night's reſt, ſhe was ſuddenly ſeized as ſhe had been in January, 1795, with dyſpnœa, attended with a convulſive kind of cough, which in leſs than five minutes from the time of attack increaſed ſo as to produce the appearance of ſuffocation. Her ſenſes forſook her, her face became livid, her extremities cold, and the action of the heart was ſo much diminiſhed that no pulſation could be felt in the wriſt, and but very little in the left ſide. As much blood as could be taken from the arm was immediately evacuated, it amounted to only about four ounces. A ſtrong ſolution of white vitriol, in water, was conveyed into the ſtomach, without producing any effect. Large doſes of emetic tartar were alſo got down every ten minutes, but no effect followed; and ſhe remained in a ſtate of complete aſphyxia nearly two hours: during which time a very large quantity of frothy ſerum, tinged a little with blood, was diſcharged, without any viſible effort, by the mouth and noſtrils. About the end of that time ſome very faint and involuntary efforts to cough came on, which gradually increaſed, and with every effort large quantities of the frothy ſerum were thrown off; perhaps the whole quantity might amount to three or four pints. About three hours after the time of attack the difficulty of breathing became very ſenſibly diminiſhed, and her ſenſes were obſerved to return. Then the medicines that had been given to occaſion vomiting operated in a moderate degree, and occaſioned the diſcharge of the contents of the ſtomach, which were not remarkable for any peculiarity either in quantity or quality. She recovered ſo faſt as to be nearly in the ſame ſtate of health that ſhe had been previous to the attack, before the evening of the ſame day, except that the paralytic ſymptoms were completely removed, and ſo unuſual a deſire for cool freſh air induced that ſhe could ſcarcely exiſt if any perſon by chance placed himſelf between her and either of the windows, which from that time were obliged to be kept open night and day. At the commencement of this attack, in my abſence from home, a phyſician of eminence was called, who preſcribed the remedies that were exhibited during the paroxyſm, and in addition directed muſk draughts and a bliſter for the cheſt. When the paroxyſm abated, from that time till the 5th of June her impatience for cool freſh air increaſed to ſo alarming a degree, tho' ſhe had been removed into a country ſituation, that ſhe frequently appeared in danger of ſuffocation. Her face almoſt always appeared bloated, and of that blue peculiar appearance that is characteriſtic of obſtructed circulation in the veſſels of the lungs. On that day you were requeſted to ſee her, and directed that the opiate ſhould be again had recourſe to; that a muſtard emetic ſhould be taken; that a teaſpoonful of ſpir. æth. vitriol. ſhould be taken, in a wine glaſs of water, two or three times a day; that exerciſe on horſe-back ſhould be uſed twice a day; and that a ſuperoxygenated atmoſphere, compoſed of two parts oxygen and eighteen of atmoſpheric air, ſhould be inſpired morning and evening; and at the ſame time requeſted, as the diſeaſe was ſo uncommon, that the opinion of a phyſician in the North, who has diſtinguiſhed himſelf by the ingenuity of his productions, might be taken upon the caſe. It was accordingly ſent him, and from that time to the 18th when his anſwer was received, the patient continued to purſue the plan that had been ſuggeſted by you, with apparent advantage. It was conſidered by him as ſpaſmodic aſthma, and extraction of diſeaſed teeth, oxygen, electricity, and the following medicines were preſcribed: — a ſcruple of the peruvian balſam, at eleven in the forenoon and at four in the evening, in the form of a draught; and half a grain of opium, as a pill, early in the morning and late at night. The opiate in this way failed to afford relief, and occaſioned ſo much drowſineſs and diſtreſſing conſtipation, that on the 21ſt, by your direction, a quarter of a grain of opium only, combined with ſix grains of rhubarb, was taken every night at bed-time; and a decoction of the yellow bark, with cardamom and orange peel, twice a day. The coſtiveneſs was by theſe means removed, and ſhe for ſome days thought herſelf better; but her impatience for cool freſh air by the end of the month had ſo much increaſed that it was thought adviſe-able to remove her into a ſituation more open, and at a greater diſtance in the country. On the 19th of July you ſubſtituted the following for what had been laſt preſcribed, with temporary good effect :

R. Cort. Salicis latifol Unc. ii ſs.
Aq. ebull—lib ii infund. per horas xii cola.
Colaturæ adde Aluminis dr. iii cap. coch. iii major. ter die.

Her ſitting-room, at her new ſituation, had three large windows and a door, ſo conſtructed as to be oppoſite each other, and nearly in the direction of the points of the compaſs; but though the houſe ſtood alone on an eminence, and all the windows and the door were kept conſtantly wide open, night and day, the neceſſity for freſh air became by the 10th of Auguſt ſo great, that I then ſaw her much diſtreſſed by a perſon placing himſelf by accident a few moments only between her and one of the windows. On that day two grains of the Extract of Hemlock, with an equal quantity of Opium, were directed by you to be taken when the impatience for freſh air was moſt diſtreſſing, in an ounce and a half of the Camphorated Mixture, with which a drop of the Oil of Cinnamon had been previouſly mixed. At this time alſo ſix glaſſes of wine were directed to be taken in the day. She again thought herſelf much relieved by the alteration of the medicine, and the allowance of wine. But at my viſit in the evening on the 13th, I found her on an open down near her lodgings, ſo diſtreſſed for want of purer air, that I was forcibly reminded of the Calcutta ſcene. Her pulſe were oppreſſed and irregular, her countenance of the cærulean appearance that had been obſerved in the moſt diſtreſſing ſtate of her complaints, and I thought

I obſerved an incoherence in her manner that was unuſual; when a friend who was with her whiſpered to inform me that ſhe was light-headed. I now expected the epileptic return, and loſt, in the proſpect of preſent danger, the hopes which had been occaſioned by the effects of the tonics and the occaſional abſence of the paroxyſms. I was however agreeably deceived by the gradual recovery that followed in a few hours after, but the event made ſuch an impreſſion on my mind that I thought much of it in the interval that occurred between that time and my viſit the next day; and from the effects that had conſtantly followed the exhibition of tonics, which had been more manifeſt when the additional quantity of wine was taken, I thought that as the cold-bath had not been tried, and as it had been ſo ſtrongly recommended by Dr. RYAN in a late work of his, that if you approved it ought to be immediately made uſe of. Accordingly on that day you were conſulted as to its propriety: and, with the precaution of a temperate bath being firſt tried, you conſented to its uſe: but recommended that the Saline Bath in the road to the Briſtol Hotwell ſhould be preferred. On the morning of the 15th ſhe firſt bathed there; the bath being previouſly raiſed by a few pails of boiling water to the temperature of 55. The relief experienced was ſo great, that ſhe felt and expreſſed an immediate aſſurance of her recovery. By my deſire the cold-bath was uſed the 17th and 20th. The ſame good effects followed. You were then made acquainted with the event, and deſired that ſhe might uſe it every day, ſince which time ſhe has been, if poſſible, more ſenſible of its good effects; and from that time to the preſent, a period of 7 weeks, has not differed in any reſpect from a perſon in the beſt ſtate of health, except that the catameniæ which had not appeared during the laſt two months, have not been obſerved to return. I have thus given you the hiſtory of this very remarkable caſe; and if the fact, by publication and your reaſoning upon it, can be made in any way uſeful, I ſhall conſider myſelf happy in having had it in my power to preſent you with an accurate and faithful detail.

Dr. Beddoes. THOMAS BAYNTON.

CASE XI.

Spasmodic Asthma.

THE Editor has before him two letters from FRANCIS GREEN, Eſq. of Denmark-Hill, Camberwell, reſpecting one of his daughters, aged 18, who had been for ſeveral years violently afflicted with ſpaſmodic aſthma. The letters are dictated by that warmth of kindneſs, which an affectionate parent feels towards thoſe whom he conſiders as having been inſtrumental in reſcuing his child from an obſtinate and moſt violent diſorder. The following are the facts ſtated by Mr. Green. The paroxyſms, before the patient's arrival at Briſtol Hotwells in October, 1795, had "come on periodically once a-week. There "ſhe grew *much worse*, until ſome ſhort time after I had "the pleaſure of meeting with you. I muſt acknowledge "I think the vital air has been very beneficial to her." This letter is dated September 14, 1796. The eſſential part of the 2d letter runs as follows:

DEAR SIR,

MY dear daughter, as well as my whole family, have every thing to thank you for. The morning we left Clifton, (where Mr. G. had continued a month) turned out very bad. We had wind and rain nearly all the way to Oxford ; what increaſed our fears moſt was, we loſt the air from the air-holder, it being unſoldered. We ſpent the next day there, and although the weather continued very indifferent, to my great ſurpriſe my daughter remained well.

The day following we reached home and waited with anxiety for the apparatus, fearful of the return of the complaint, but to our great joy I aſſure you ſhe has not had a fit ſince. We have continued the uſe of the air except at ſhort intervals, and about two months back took her to Brighton by way of trial, but the ſecond day after our arrival, (the weather was very changeable) perceiving a weakneſs in her eyes, which I have always conſidered as a ſymptom of the old complaint, we returned immediately to Camberwell, where after ſtaying a ſhort time, the weather coming on fine, we came again to this place for another trial, and have the ſatisfaction to ſay ſhe has continued well without the uſe of the air.

I am, dear Sir, &c.

FRANCIS GREEN.

Brighton,
September, 1796.

Extract

Extract from a letter from Dr. THORNTON *to* Dr. REYNOLDS.

CASE XII.——*Dyspnœa.*

IN the Spring ſucceeding the ſevere Winter of 1795, which was characterized by inflammations of the cheſt, the patient you did me the honor to confide to my care ſuffered with others. The apothecary, who at that time attended, neither bled or bliſtered him. As the ſequel to this inflammatory attack, he has been ſubject to dyſpnœa, more eſpecially upon uſing the ſlighteſt exerciſe. Now, my dear Sir, in ſuch unfortunate ſubjects, where the lungs were inflamed, I have found upon diſſection, *obliterated air-cells*, and, where the pleura was the ſeat of the inflammation, *numerous adhesions.* In either caſe little can be done or expected from medicine. Nevertheleſs, as the diſeaſe might be palliated, and the conſtitution ſtrengthened, by the inhalation of an atmoſphere of a higher ſtandard, the trial was authorized, and the caſe is beautiful in itſelf as throwing conſiderable light on the ſubject of reſpiration. Mr. A. before the inflammatory attack on his lungs was florid, and of a clear complexion: he had once even hæmoptoe; now his cheeks are devoid of colour, and his aſpect extremely bilious. Before, heat was inſufferable; now he enjoys a fire even in the midſt of Summer. Before, his pulſe, as he informs me, was accounted full; now it vibrates feebly and quickly. Whilſt he inhales a ſuper-oxygenated atmoſphere, he always feels his reſpiration eaſy; his parched hands become ſenſibly moiſt; he has a glow and tingling ſenſation in his fingers; and as Dr. Haighton, the lecturer on Phyſiology at Guy's-Hoſpital, noticed, his pulſe is rendered both ſlower and conſiderably ſtronger. Immediately after this eaſy proceſs, he has obligingly gone down ſtairs, and upon coming up again, he has breathed perfectly free, as many ſpectators have witneſſed. In this caſe might not a conſtant inhalation of an atmoſphere of a higher ſtandard produce the moſt certain and eſſential ſervice: but this, my dear Sir, is reſerved for a more advanced ſtate of the Pneumatic practice, when rooms ſhall be fitted up for that purpoſe.

I have the honor to be, &c. &c.

R. J. THORNTON.

Obſervations on this Caſe.

1. This inflammation of the lungs was occaſioned by looking over furniture, which was kept in a damp room. To remove the chill this produced, (which is generally the forerunner of fever) recourſe was had to brandy and water, and Mr. A. took white wine whey at night, the pernicious conſequences of which practice Dr. Beddoes juſtly deplores. Vide Obſervations on Fever, *Catarrh*, &c. Printed for Murray.

2. Do not nine dyſpnœas out of ten proceed from previous inflammation of the organ of reſpiration?

3. Can adheſions, when they take place, be elongated by the adminiſtration of emetics?

4. Can obſtructed air-cells be renewed by a frequent and forcible expanſion of the lungs?

5. When coagulable lymph is depoſited, can this be abſorbed by paſſing into the lungs ſubſtances ſuſpended by the active powers of certain airs? R. J. T.

CASE XIII.——*Dyspnœa.*

July 2, 1796. *Bennet-street, St. James's.*

Dear Sir,

THE ſubject of this report is a very corpulent gentleman, who had been afflicted more or leſs with dyſpnœa for twenty years, and under different phyſicians with little or no alleviation of his complaint. Mr. Colvin had commonly but ſmall appetite; was troubled with dyſpepſia; and of a coſtive habit of body. Upon coming up ſtairs he was accuſtomed, as he gave at firſt evident demonſtration, greatly to puff and blow; having, as he expreſſed himſelf, *no wind.* He was troubled with lowneſs of ſpirits; his body was diſtended; and his nights were ſo diſturbed, that he ſeldom ſlept three hours together. After he had been under my care but a fortnight, he came with his partner, Mr. Lowndes, a wine-merchant at Temple-Bar, who aſſured me, that he thought Mr. Colvin was better than he had ſeen him theſe laſt eighteen years. Having inhaled ſix quarts of vital air mixed with thirty of atmoſpheric, this gentleman felt, as uſual, the eaſieſt reſpiration; a genial glow with perſpiration; vigour, and *lightsomeness;* or in a word, for theſe are his own expreſſions, *the sensation of indescribable health.* Upon aſking him, whether he perceived he was ſtronger? in an energetic tone of voice, he declared, *he felt five times as strong;* he added alſo, that his appetite was returned; and his ſleep was undiſturbed and continued throughout the night. He then went down ſtairs in the preſence of Mr. Lowndes and Mr. Curtis, the ſon of an eminent ſurgeon at Chiſwick, and having come quickly up ſtairs, he was able freely to diſcourſe with us *immediately*, which Mr. Lowndes declared, he had not done for years, nor was this a tranſitory effect, for the ſame was obſerved by all his friends both at home and abroad.

Observations on this Case.

1. Did not the corpulency of this gentleman denote a deficiency of oxygen in the ſyſtem? Let the reader here conſult your obſervations on Obeſity; printed for Murray.

2. Did not his dyſpnœa depend wholly, as in chloroſis, ſcurvy, putrid fever, &c. upon a want of a due quantity of oxygen, or vital air, in the blood?

3. Did not his defective appetite, impaired digeſtion, flatulence, coldneſs of the extremities, and torpor of the alimentary canal, proceed alſo from a want of a due quantity of the ſame principle; for in proportion as his ſyſtem was more oxygenated, all theſe diſtreſſing ſymptoms diſappeared?

4. I ſhould perhaps here obſerve, that as I ſupplied the lungs with air, I was mindful to obviate coſtiveneſs, and gave the ſame tonics, which before had been often and ineffectually applied,: Are we not therefore in this caſe to attribute the cure almoſt wholly to the exhibition of the ſuper-oxygenated air?

R. J. T.

Extreme Weakneſs, or what would not be improperly called a Decay of Nature.

CASE XIV.

July 4, 1796. *Bennet-ſtreet, St. James's.*

Mrs. ROBERTS, aged ——, who lives at No. 43, Piccadilly, was more than twelve years ill. She had been ſucceſſively under the moſt eminent Phyſicians, firſt under Dr. Pinkſton, then under Dr. Cadogan, next a full year under the celebrated Dr. Cheſton of Gloceſter, from him ſhe paſſed under the hands of Dr. Farmer, of that city, who attended for two years, and ſhe was next under a diſtinguiſhed practitioner of Bath, and ſo ſhe went from one able practitioner to another; ſhe was at laſt ſo reduced, that ſhe was not only confined to her room, but could ſcarce get from her bed to an eaſy chair, which was placed in it. Dr. Merryman now attended her. Her appetite was gone; her ſpirits ſunk; her countenance hippocratic; and her nights were not unfrequently without ſleep. Being called in, I premiſed a mild aperient, and afterwards ordered bark and lime-water, and gave Mrs. Roberts the vital air. At the time of inhalation this lady felt greatly relieved; the yellowneſs of her complexion ſoon wore off; ſhe had a glow of warmth; her appetite and perſpiration were eſtabliſhed; and ſo ſudden was the amendment, that in leſs than a month ſhe was reſtored to perfect health, and has continued ſo (except a ſlight diſcolouration [blackneſs] of the leg, which was removed by the vital air in a few days) now for above four months.

I am, dear Sir, &c.

Dr. Beddoes. R. J. THORNTON.

P. S. The quantity of vital air given was ſix quarts to thirty of atmoſpheric.

CASE XV.

Communicated by Dr. Lawrence, of Swaſham, Norfolk.

December 30, 1795.

MISS L. G. 19 years of age, had a ſuppreſſion of the Menſes for more than two years. Her countenance was pale in the extreme; lips white, appetite impaired, general ſenſation of coldneſs, and averſion to exerciſe. Chalybeates, with other deobſtruent and aperient medicines, were directed for her;—as theſe had been continued for three weeks without the deſired ſucceſs, ſhe inhaled on the 20th of January, 1796, a mixture of three quarts of oxygene and 19 quarts of atmoſpheric air. It was adminiſtered only once a-day, and in leſs than a week the patient was enabled to walk nearly three miles every morning for that purpoſe, with great eaſe, which ſhe could not do at firſt without much fatigue; ſhe attended afterwards with leſs regularity, not more than 12 doſes having been inhaled in three weeks. She was ſenſible of its exhilarating effects, and derived a moſt remarkable degree of advantage from ſo ſmall a number of inhalations. Her cheeks and lips acquired the ruddy glow of health, the appetite was perfectly reſtored, and indolence and laſſitude were ſucceeded by activity and ſpirits. She had not experienced (her own expreſſion) ſo good a ſtate of health for two or three years. The Menſes had not returned at the time ſhe diſcontinued the oxygene, but ſhe has ſince continued in perfect health.

R. EMERSON.

Swaſham,
25th Auguſt, 1796.

CASE XVI.

Aug. 26, 1796. *Bennet-ſtreet, St. James's.*

SIR,

ELIZABETH BYWORTH, aged 17, was in ſervice at Mr. Long's, New-Wharf, White-Friars, when from catching cold, the natural female relief forſook her, and ſhe became ſubject to frequent hyſterics; her countenance was bilious; ſhe had qualmy ſickneſs in the morning; appetite irregular; dyſpnœa upon the ſlighteſt exerciſe, to which ſhe felt extremely diſinclined; and ſo great debility that ſhe was unable to maintain her place. To theſe ſymptoms ſucceeded fainting, three or four times a-day; a continued diſturbance in the inteſtinal canal; ſpongy gums; towards evening, chillineſs; but more frequently much external heat; no perſpiration; and an irregular exoneration of the bowels. Notwithſtanding the methods employed, this complaint remained above three years, during which time ſhe lived with her mother, No. 6, Water-lane, Fleet-ſtreet. In getting from thence to Bennet-ſtreet, ſhe was above an hour and a half, and was quite exhauſted with fatigue. She continued as a patient five weeks, during which time ſhe took two emetics, aloetic and ſteel pills, and ſhe inhaled daily thirty quarts of atmoſpheric air, ſuper-oxygenated with ſix quarts of vital air; at the end of leſs than four weeks ſhe was able to walk here without fatigue in half an hour; ſhe had no ſickneſs at the ſtomach in the morning; could go up an aſcent without ſtopping, and ſcarcely panting; the gums ceaſed to bleed; the appetite was conſtant; the lips were red; the pulſe bold and regular, inſtead of quick and thready; her natural perſpiration returned; and the complexion was ſo ameliorated, that the change did not fail to be noticed by every one. She has ſince gone to live as ſervant in a family in Old-ſtreet, being now in *every reſpect* in perfect health, and adequate to the ſituation.

From, Sir, your's ſincerely,

Dr. Beddoes. R. J. THORNTON.

REMARKS

ON

THE FOREGOING CASES,

BY

THE EDITOR.

REMARKS.

THREE of the preceding Caſes came under my own obſervation. They were among the worſt in their kind; and the event, as far as we can perceive at preſent, has been eminently ſucceſsful. Mr. Hare and Miſs —— Green I ſaw every day for three or four weeks; and Mr. Baynton's female patient I viſited eight or nine times. In the two firſt inſtances the fits were very frequent and ſevere; but they were in other reſpects ſuch as are commonly to be obſerved in ſpaſmodic aſthma. I do not therefore think it neceſſary to enter into any diſcuſſion concerning the ſymptoms. But there are a few facts which it would be unfair if I were to conceal from the reader. Mr. Hare began with one quart of oxygen air to above twenty of atmoſpheric, twice a-day—he never exceeded three quarts of oxygen at one doſe. The morning after the ſixth doſe he obſerved ſome ſtreaks of blood on a ſmall quantity of mucus, which he had expectorated. This was not attended, nor to the preſent day, (Sept. 23, 1796, on which I have ſeen Mr. H. in excellent health) has it been followed, by any ſuſpicious ſymptom. From my idea of the ſtimulating power of oxygen gas I felt ſome alarm, and perſuaded my patient to deſiſt from the uſe of the air for a day or two; and at this moment I believe that I ſhould have adviſed the entire diſcontinuance of it. But Mr. H. who laid no ſtreſs upon the occurrence, was little diſpoſed even to procraſtination; and he expreſſed a firm reſolution to run ſome riſk in order to procure an abatement of his haraſſing complaint. He accordingly went on reſpiring diluted oxygen till the time ſpecified in his letter, ſince which he has not reſumed it. Like many other aſthmatics, he was particularly liable to catarrh ; in conſequence of which he never failed to have a paroxyſm. Apprehending he had taken cold once or twice during the firſt fortnight, I ordered him four or five grains of antimonial powder at bed-time. Some London phyſician, in conſideration of his weakened habit, had ſuggeſted to him the propriety of taking tonic medicines. I did not ſcruple to order pills of equal parts of extract of gentian and ſulphate of iron (green vitriol), of which after leaving Clifton Mr. H. took ſix or eight grains a-day for ſome time. For this twelvemonth paſt he has not taken an atom of any opiate or any antiſpaſmodic medicine. The apparent improvement of this gentleman's conſtitution is, in my opinion, ſtill more remarkable than the diminiſhed frequency and force of his diſorder. Oxygen air has frequently enabled perſons to bear cold better ; and I have met with no one who ſeems to have experienced this agreeable change to a greater degree than Mr. Hare.

When I was called to Miſs —— Green, I found her labouring under an attack of aſthma, which with ſome ſmall remiſſions, continued three days and nights. Her fits had been of late ſo ſevere as to give her friends the idea of immediate danger. Beſides oxygene air, ſhe has taken the *mineral ſolution* of Dr. Fowler, ipecacuanha in ſmall doſes, and likewiſe as Mr. Green informs me, five or ſix emetics ſince October, 1795 ; an emetic having been given when ſhe perceived a *huskineſs* in her throat ; I ſuppoſe leſt a fit of aſthma ſhould come on after a catarrh.

The circumſtances obſervable in the laſt of theſe three patients, were exceedingly remarkable: nor do I remember to have met with a caſe better fitted to ſerve as a *study* for the phyſician. I endeavoured, by obſervation, reflection and communication with the perſon, whom I thought beſt calculated to elucidate its difficulties, to aſcertain the order and connection of the phaenomena. They appear to me ſuſceptible of a tolerably compleat elucidation. And I may render an acceptable ſervice to thoſe who deſire to penetrate into the ſecrets of the animal œconomy, if I here introduce the ideas that occurred to myſelf on the firſt examination of the patient, as they were committed to paper and ſubmitted to the inſpection of two medical practitioners, the opinion of the eminent phyſician who was conſulted by letter, and the corrected judgment which the courſe of the diſorder and the operation of medicines, have led me to form.

The unceaſing neceſſity for cool freſh air, which obliged the patient to have the windows of her apartment open day and night for months, diſtinguiſhes this caſe from common inſtances of difficult breathing, whether belonging to the denomination, *asthma* or *dyspnœa*. In the fit, the long-continued ſuſpenſion of conſciouſneſs and voluntary power is a ſingular occurrence; and the extraordinary quantity of bloody mucus eliminated deſerves notice. This fluid was aſcertained by careful enquiry to be mucus, and not ſaliva, as I at firſt ſuſpected.

Holding theſe curious particulars in view, I concluded my letter to the phyſician, above alluded to, in theſe terms; “ The firſt impreſſion made upon the ſpectators

" by theſe attacks has been that they are mere aſthmatic " paroxyſms. But the *inceſſant* demand for the higheſt " ſtimulus which atmoſpheric air is capable of yielding, " proves that the lungs are habitually inirritable. This " is not the caſe in ordinary aſthma. The paralytic " affection of certain muſcles which ſucceeded that " ſeizure, in which reſpiration was totally ſuſpended, " ſeems to imply a failure in the ſupply of vis vitæ to " the ſyſtem in general, and the lungs in particular. " This cauſe I ſuppoſe would produce a general groſs re- " ſemblance to an aſthmatic paroxyſm. The extraordi- " nary flow of mucus might be imputed to a retrogade " motion of the abſorbents. The claſs of phaenomena, " which has been referred to this principle, is gene- " rally marked by deficient ſtimulation or deficient ex- " citability—that is—by deficient excitement. On theſe " grounds, which I need not further detail to you, does " not an hyper-oxygenated atmoſphere promiſe to do " ſervice? And might not friction and electricity be " applied to the thorax with propriety? with moderate " doſes of opium at ſtated times, and alſo of ſteel? ex- " traction of bad teeth?"

The opinion of the conſulted phyſician, as addreſſed to the Editor, was as follows:

" I have conſidered with care both the letter you have favoured me with, and that from Mr. Baynton, concerning the caſe of Mrs. —. As I underſtand that the paroxyſms are always attended with difficult reſpiration, though not preceded by it; and as ſhe frequently wiſhes for freſh or cool air; and laſtly, (as mentioned in Mr. Baynton's letter) as ſhe has very frequently miſcarried; I am

I am induced to believe theſe paroxyſms to be aſthmatic; and on that account ſhould recommend the trial of oxygen gas diluted with atmoſpheric air. As there is reaſon from your original obſervation to believe, that pregnant ladies expend more oxygen in ſupplying it to the fœtus, than when they are not in that ſtate; I have lately directed a lady, who has very frequently miſcarried, to inhale oxygen, and ſo far I hear with good event.

Secondly, as ſhe becomes quite inſenſible to external objects during the laſt part of the paroxyſm, this ſeems ſimilar to the ſtupor which generally terminates epileptic fits; and differs from ſyncope, in which, (according to Cullen) the motion of the heart is ſtopped or diminiſhed.

My general idea of this diſeaſe is, therefore, that it is an aſthma of the convulſive or epileptic kind. The good effect which ſhe has generally received from an opiate, when given ſoon enough, ſeems to confirm this idea of the diſeaſe.

1. I ſhould certainly adviſe, as you have ſuggeſted, an extraction of thoſe teeth, which are ſo far decayed as to be uſeleſs to her.

2. The reſpiration of oxygen gas once or twice a-day.

3. Daily equitation, or friction, or other exerciſe; ſhe ſhould live in well ventilated rooms, both parlour and bed-chamber, and, if it can be done, go from home for change of air. Electricity alſo is worth trying.

4. In reſpect to medicine ſhe ſhould, if you approve, take half a grain of opium in a ſmall pill twice a-day, as at breakfaſt and at going to bed. Which, if ſhe again

becomes pregnant, ſhould be increaſed to a grain twice a-day, and ſhould be perſiſted in for *many* months, ſo as to introduce a new habit of increaſed energy in the whole ſyſtem.

5. Her habits of life ſhould be regular, that is, ſhe ſhould go to bed by ten, and drink nothing ſtronger than wine diluted with thrice its quantity of water, or very weak ſmall-beer.

6. Some medicine, which evidently increaſes the pulmonary exhalation, ſhould be uſed, as a draught twice a-day, conſiſting of balſam of Canada or Peru a ſcruple, diſſolved in a drachm of honey and an ounce and half of water, and a drachm of tinct. cinnam.—or aſafœtida in pills or ſolution. onions ? garlic ?

7. If the returns of the paroxyſms can be foreſeen, an addition of opium, as 20 or 30 drops of the tincture, ſhould be given half an hour before the expected attack, and omitted at other parts of the day."

On a retroſpect of circumſtances one can, I think, ſcarce heſitate to pronounce the complaint *a defect of energy in the pulmonary capillaries and lymphatics.* At the time of the moſt formidable ſeizure, this was ſo conſiderable that the red particles of the blood found their way along with the mucus either through the exhalants or the abſorbents. The diſtreſs, occaſioned by the debility of theſe veſſels, when this debility was greater than common, might, indeed, eaſily excite ſpaſms in the muſcles of reſpiration : and, if ſo, the fit would be truly termed a fit of epileptic aſthma. But as aſphyxia will come on from a given inaction of the capillaries of the lungs, ariſing from an internal conſtitutional cauſe, with no leſs certainty than from immerſion in an unreſpirable medium, there might in theſe fits have been nothing of ſpaſmodic contraction of the diaphragm or other co-operating muſcles. I could not aſcertain the exiſtence of ſtricture by enquiries from the patient. The violent fit of May 23d, 1796, came on immediately after a voluntary exertion, which for ſuch a patient muſt be deemed conſiderable. She roſe out of bed (probably in ſome haſte) to view a proceſſion paſſing along the ſtreet. And I apprehend an effort of this kind, in which body and mind were concerned, might have exhauſted ſo much of the power of life, as to occaſion the ſubſequent aſphyxia and paralytic feelings.—No attentive reader of Mr. Baynton's communication can be at a loſs for the cauſe of the weakneſs in the veſſels on the ſurface of the lungs. He ſpeaks of a catarrh and cough of many months' continuance as preceding the other complaint. Add to which, the patient has, in my opinion, a decidedly *inirritable* temperament.

During Mrs. ——'s continued uſe of the (ſo-called) *tonic* medicines ſhe felt ſome abatement of her complaint. She ſometimes breathed with unuſual eaſe, and once found herſelf ſo well as to undertake a walk of above two miles, an exertion to which for a long time before ſhe had been nothing like equal. But the amendment laſted only for a little while; nor, though in a high and open ſituation, was ſhe two whole days and nights without an anxious ſenſe of want of freſh and free air: The cold-bath alone produced the continued feeling and the aſſurance of reſtored health. The fits ſeemed to have a tendency to return with violence once a month; and two of theſe periods have now paſſed without a token of relapſe.

The effect of oxygen diluted in the doſe of 2—6 quarts a day did not appear to me very ſtriking: and this caſe ſeems to confirm the inference deducible from Mr. Kentiſh's obſervations on Capt. Hemſley; *that oxygene directly stimulates the blood-vessels only*; *and not the absorbents.* If a chamber filled with modified air had been at my command, the effect of air moderately hyper-oxygenated and reſpired long might have been well aſcertained by this caſe; and ſo, if a proper eſtabliſhment had exiſted, might the identity or difference in medicinal effect between oxygen from growing vegetables and from minerals.

The benefit to be expected from the cold-bath in ſimilar caſes is the great practical moral to be drawn from this hiſtory. Mrs. —— glowed much after its uſe; and it may be concluded that ſuch energetic action of the capillaries of the ſkin, communicating itſelf by ſympathy to thoſe of the lungs, reſtored to them their healthy powers. Poſſibly the preceding liberal uſe of tonics was not indifferent to the degree of ſucceſs which has been experienced in this inſtance. Since the publication of the work mentioned by Mr. Baynton, I have been attentive to the uſe of the cold-bath in undoubted ſpaſmodic aſthma; and as ſeveral of the worſt poſſible caſes of this diſorder have come under my care, I am in poſſeſſion of ſome important facts on this intereſting ſubject. Theſe facts are at this moment accumulating; and I ſhall preſent them to the world either in the Appendix to the preſent pamphlet, or in ſome future publication.

CASES

OF

CATARRH,

PULMONARY HÆMORRHAGE,

AND

CONSUMPTION.

CASES.

CASE XVII.——*Catarrh.*

I SHOULD not trouble you with the following fact reſpecting hydrogene gas in the inflammatory ſtage of catarrh, were it not ſupported by analogous caſes in which ſometimes unreſpirable airs and ſometimes æther-vapour have been employed.

Friday, Feb. 19, 1796, I felt indiſpoſed with ſlight ſymptoms of Fever, accompanied with that particular ſenſation in the cheſt which I had been much accuſtomed to feel at the commencement of violent catarrh. In this ſituation I dined with a medical friend and imprudently drank more than a pint of wine. I paſſed a reſtleſs night, and in the morning all my ſymptoms were increaſed. The mucous membrane of the noſe was greatly affected, and I began to cough frequently and painfully. I procured ſome hydrogen gas, two quarts of which diluted with twenty of common air, I inhaled twice in the forenoon. Not finding relief, I determined to uſe undiluted hydrogen, as often as I felt a diſpoſition to cough. I fitted a perforated cork provided with a ſtopper to a bladder of at leaſt three gallons capacity. Having expired forcibly, I put the cork to my mouth and drew in the hydrogen, and then expired it into the bladder: this I did whenever I felt a diſpoſition to cough, from which I reſtrained myſelf as much as poſſible. The next morning I felt myſelf conſiderably relieved. I had recourſe again to the hydrogen, ſometimes breathing into the bladder, and at other times ſlowly through the noſtrils, to relieve the diſagreeable ſenſation I experienced there. Monday I felt the diſpoſition to cough very trifling, and Tueſday I had not the ſlighteſt remains.

From what I have before experienced (and I have been extremely troubled with violent catarrhs) I am perſuaded that the benefit ariſing from the uſe of factitious air in twelve hours is greater than that which would be obtained in a week from the uſual mode of practice.

I have not (fortunately for myſelf) had an opportunity of again making trial of its efficacy, but it will certainly be the firſt remedy to which I ſhall have recourſe in a ſimilar ſituation.

I am, dear Sir, your's truly,

To Dr. Beddoes. THOMAS ROLPH.

CASE XVIII.

Pulmonary Abscess.

No. 435, *Oxford-street, Sept.* 1, 1796.

SIR,

I AM happy to find that the ideas you firſt ſuggeſted reſpecting the nature of conſumption are likely ſoon to meet with an ample inveſtigation by the eſtabliſhment of a Pneumatic Inſtitution. Patients were long ſince ſent from their families and home under the ſuppoſition that the air of other climates better ſuited their diſeaſe than our own, but what was the effect of air on the conſtitution ſcarcely ever entered into the conſideration of the practitioner, much leſs to turn it *here* to any account.—

The encloſed caſe will confer conſiderable weight on the mode of treatment you ſuggeſted, and as Dr. Thornton will ſend you the progreſs, I ſhall only lay before you the ſtate of my patient, previous to my recommending him to the care of that indefatigable and ingenious phyſician, and ſhall add a few words reſpecting his preſent condition of health.

Mr. Dorgan, married, having a family, aged 41, was with a party of friends at Deptford, Feb. 10, 1796, where he was induced rather to exceed in the quantity of liquor, and the evening turning out rainy, was wet through: the next day he was ſeized with ſhiverings, ſucceeded by fluſhings of heat; head-ach; violent pain in the right ſide; difficult breathing; dryneſs of the noſtrils; and other marks of an incipient peripneumony; the ſymptoms were ſo violent as to oblige him to take to his bed. I was immediately ſent for, and from the urgency of the caſe, I thought it right to call in the aid of a phyſician, Dr. ——, who ordered him to be blooded, bliſtered, as well as purſuing the other antiphlogiſtic methods which are uſually practiſed in this complaint. After fifteen days Mr. Dorgan was able to leave his bed; but the cough ſtill continued with copious expectoration, which upon trial with water ſunk to the bottom.—We continued our attendance to the 24th of March, when from the rapid progreſs of the diſeaſe which had all the appearance of phthiſis pulmonalis, we recommended the trial of the hydrogene, or hydrocarbonate, air. From his being a very corpulent man, he was ſo far reduced, that his clothes ſat like a ſack on his body; naturally of a ſtrong make, he was ſo weakened, as to be obliged to uſe a ſtick; conſtantly haraſſed with a hollow cough

which

which produced purulent expectoration to the quantity of a pint during the twenty-four hours, accompanied with hectic fever, drought, colliquative ſweats during the night and in the morning, loſs of hearing, his eyes dim and ſometimes for a few moments failed him ; his appetite was gone, indeed every thing ſeemed to prognoſticate a ſpeedy iſſue. Under theſe inauſpicious circumſtances he began the trial of a reduced atmoſphere, and indeed we had not the ſmalleſt expectation of his recovery, the diſeaſe appearing ſo extenſive in his cheſt.

I am happy that our prognoſtics failed, and to add I have ſince ſeen Mr. Dorgan, and he is free from cough ; has no night ſweats ; has recovered his former bulk ; and looks as fine and hearty a man as any we may meet with in a hundred.

I am, Sir, &c.

To Dr. Beddoes. WILLIAM DEAN.

Journal of this Case.

March 25. Mr. Dorgan, living in Church-ſtreet, Bloomſbury, ætat. 41, was attacked with Pneumonia, which terminated by a diſeaſed ſecretion, or abſceſs of the lungs, occaſioning chill in the day, hectic fever at night, and profuſe perſpirations, more eſpecially towards morning, great emaciation, and extreme debility ; what he ſpit up ſunk in water, and upon examination with a ſtrong lens, it appeared filmy, and covered with ſmall air-bubbles, and was of a clear ſtraw colour. Feels uneaſineſs upon making a deep inſpiration, complains of a dull pain at the ſternum, a haraſſing cough, dimneſs of ſight, (perhaps from previous inflammation of that organ) thickneſs of hearing, (probably alſo ariſing from the violent cold which was the foundation of the preſent diſeaſe) hoarſeneſs, more eſpecially towards night; has a tongue extremely white, edges rather florid, pulſe 110, rather full and tenſe, appetite gone, ſpirits unuſually depreſſed, but poſſeſſes great fortitude of mind. Mr. D. has the appearance of being formerly a very ſtout man, is near ſix feet high, his eyes are weak and blue, his complexion fair, his hair light, and he was before often ſubject to very ſevere colds. Ordered a large bliſter on the ſternum, an aperient in divided doſes, and the ſyrup of white poppies at night.

March 27. No alteration.

Ordered the aperient and ſyrup to be repeated, and a fleecy hoſiery waiſtcoat to be procured as a ſubſtitute for the flannel. Inhaled a reduced atmoſphere, viz. one quart of hydro-carbonate to forty of atmoſpheric air, had continual catchings of his breath as he inhaled it, his pulſe which was 110, full, and ſtrong, was rendered ſoft and feeble, and rather quickened. Felt ſome uneaſineſs at his breaſt at the time, a little faintneſs, vertigo, and ſickneſs, which prevented him from inhaling the quantity prepared.

March 29. Feels rather more debility, with acute ſhooting pains in the ſide.

Ordered another bliſter, and an aperient. Inhaled a reduced atmoſphere, the ſame effect nearly as on the 27th.

March 31. Free from pain in the ſide, but no otherwiſe amended.

Ordered a Burgundy pitch plaſter on the ſternum of a large ſize, a tonic mixture of bark and myrrh, an emulſion of milk and oil of almonds made up with gum arab. and ſugar, and the anodyne ſyrup at night. Inhaled a reduced atmoſphere, the catchings were inconſiderable, it produced a ſoothing refreſhment, and a ſenſe of coldneſs at the time, which was ſucceeded by the mildeſt glow, and pulſe 90, ſoft and feeble, which increaſed to above a hundred ſoon after the inhalation.

April 1. Is much mended, ſlept throughout the night, and what is expectorated is leſs filmy, and ſinks with ſome difficulty.

Ordered the ſame medicines, but inſtead of the tonic mixture at night an aperient, and the tonic to be reſumed the next evening, and the following morning.

April 3. Amendment viſible.

Repeated the medicines as on the 31ſt of March. The reduced atmoſphere no longer produced nauſea or vertigo, but a ſoothing tranquillity, and a diminution of pulſe. No catchings of the breath, and the inſpirations were deeper and eaſy.

April 4, 5, 6, 7, 8. All the ſymptoms of diſeaſe are diminiſhed.

Purſued the ſame medicines as were ordered March 31.

April 9. The appetite is keen, feels his ſtrength conſiderably increaſed, ſo that inſtead of an hour and a half, he walked here in little better than thirty minutes, the cough is leſs troubleſome, what he expectorates is chiefly in the morning and evening, nights good, no pain, entertains the hope of a ſpeedy recovery.

April 10. Continues mending.

Ordered an aperient, as on April 1. Continues to inhale a reduced atmoſphere.

April 12. Continues mending, before obliged to uſe a ſtick, now had left it behind, having no occaſion for one. Upon examining the expectoration the greater part ſwam, and only after ſome agitation did ſome lumps ſink in the water.

April 13. Left off a great coat, feels to-day a violent ſtitch in the right ſide, cough increaſed, conſiderable hoarſeneſs, tongue very white, pulſe 90, full, eyes heavy, ſtrength diminiſhed, much irritatien at the breaſt.

Ordered a bliſter, and an aperient to be taken in divided doſes, the tonic mixture to be diſcontinued, and an aperient to be repeated again the next morning. Inhaled a reduced atmoſphere, which occaſioned violent catchings of the breath, as at firſt, and therefore it was perſiſted in only for a few minutes.

April 15. Pain ſubſided, cough much abated, no hoarſeneſs, complexion much improved, pulſe 76, ſays " he feels much better to-day than for a long while."

Ordered the tonic mixture to be reſumed in increaſed force, and directed porter at his meals, and a more generous diet. Inhaled the reduced atmoſphere with advantage.

April 16, 17, 18, 19. Cough very moderate, the expectoration has ceaſed to have any unpleaſant taſte, and ſwims for the moſt part on the ſurface of the water. It has a browner caſt, and appears bluiſh in the morning.

April 20, 21, 22, 23, 24. Continues mending, ſeldom coughs, appetite extremely good, ſpirits elated, thinks he will be well in a few days.

Ordered the opium to be left off, and leſs of the tonic mixture to be taken.

April 25, 26, 27, 28, 29. Daily mends, never coughs but in the morning, and towards evening, and what he expectorates floats, is increaſed in bulk; nor has he need of the opium.

Ordered the bark and hydro-carbonate to be left off for a week, and the patient to go into the country.

May 10. Mr. D. returned, perfectly recovered.

Sept. 1. Saw Mr. Dorgan, who has ſince continued in excellent health, and has no apprehenſion, or I truſt, danger of his former complaint, the diſorder being rather *adventitious*, than natural to his conſtitution.

* * *

CASE XIX.—*Consumption.*

Aug. 13, 1796. *Bennet-street, St. James's.*

ROBERT SCANTLEBURY, married, aged 35, living at No. 33, Crown-ſtreet, Finſbury-ſquare, has laboured under a diſeaſe of the cheſt nearly ſeven years. He imputes its origin to a violent cold, leaving behind a cough, which was very troubleſome during the Winter, and at firſt conſtantly diſappeared in the Summer months.

For the laſt two years he has experienced no intermiſſion. He ſpits up a great deal of a *something*, which, when put into a glaſs of water, appears white and flocculent, and ſoon ſubſides to the bottom, and when viewed by the microſcope ſhews the appearance of a thin web replete with air-bubbles. He had ſeldom above two or three hours ſleep, ſo troubleſome was his cough. He had feveriſh heat towards evening, which diminiſhed by ſweating in the morning; a parched white tongue, with florid edges and ſpots; chillineſs during the day; and a circumſcribed red ſpot on the cheek-bone. He often complained of a dull pain under the ſternum; hoarſeneſs towards evening; and ſo much debility, that he was above two hours in getting to my houſe in Bennet-ſtreet, repeatedly taking hold of the rails of houſes, as he went along. His appetite was good, and what ſeemed rather unuſual in his complaint, he had little or no expectation of recovery, which perhaps might ariſe from the continual good-nature of honeſt friends, who were conſtantly expreſſing their concern at his ſituation. He had taken a deal of medicine without benefit. The plan I purſued with him, was emetics and cathartics to make the bark agree; ſyrup of white poppies at night to aſſuage the cough; and he inhaled the hydro-carbonate in the proportion of one quart to forty of atmoſpheric: He was ordered a fleecy hoſiery waiſtcoat; and had a large Burgundy pitch plaſter on the breaſt. The reduced atmoſphere invariably produced a general ſenſe of coldneſs and refreſhment over the frame; and at firſt ſlight vertigo, and nauſea, which ſoon diſappeared, and ever after, he went away under the perſuaſion he was mended by the hydro-carbonate, and ſoon acquired the full confidence, that he ſhould ſpeedily recover; nor was this expectation fallacious; for his cough daily grew leſs inceſſant, his nights were ſeldom diſturbed, he felt his ſtrength ſo far increaſed, that he could walk here in half an hour; and what he ſpit up was bluiſh, or reſembled clear mucus, which ſwam on the ſurface of the water. He ceaſed to have exacerbations of heat and cold, with perſpiration in the morning, and his friends univerſally noticed the ſurpriſing alteration in his looks. After five weeks he took his leave, without cough; increaſed in fleſh; and ſeemingly perfectly recovered of his former complaint.

Sincerely your's,

To Dr. Beddoes. R. J. THORNTON.

◆

CASE XX.—*Consumption.*

SIR,

AMY CHATFIELD became my patient on the 23d December, 1795, and continued ſo till Jan. 20, 1796. Her complaints were cough, pain, and great tightneſs at her breaſt; frequent and hard pulſe, and very conſiderable ſpitting of blood. She was bled and bliſtered, and took ſedative and gently opening medicines, which at firſt relieved her; ſhe had leſs pain, and the hæmoptoe was conſiderably diminiſhed. I attributed the relief ſhe experienced more to the bleeding and bliſtering, than to the medicines ſhe had taken, and was deſirous of repeating them; but ſhe was not to be prevailed on; I therefore diſcontinued my viſits.

She is a woman of a fair pale complexion, with light hair approaching to red. Her lady, Mrs. Bourke, aſked my opinion of her; I told her that her ſituation was ſuch as to give very little hopes of recovery, and as ſhe was incapable of doing her buſineſs, recommended her being ſent to the country. From the above time till the 7th inſt. I had ſcarcely ſeen her; and indeed was *surpriſed* at the very great change that had taken place in her health. Her face, though naturally pale, appeared healthy; ſhe ſaid her appetite was good, that ſhe was capable of doing her buſineſs, and that ſhe was perfectly well.

Sept. 15, 1796. H. COATES.
Howland-street, Fitzroy-square.

Journal of Amy Chatfield's Case.

April 9. Amy Chatfield, æt. 25, lives as ſervant at Mrs. Bourke's, No. 50, Charlotte-ſtreet; for ſeveral months has had hæmoptoe, her expectoration is now ſtreaked with blood, ſinks when immerſed in water, cough hard and frequent, tongue florid at the edges, countenance pallid, except when attacked with fever, which comes on towards evening, perſpirations in the morning, emaciation, breathing oppreſſed, a tightneſs, like a rope, acroſs the breaſt, ſo much debility that ſhe was above an hour and a half in getting to my houſe in Bennet-ſtreet, leaning on the arm of a companion, and ſitting down upon the ſtone ſteps of houſes ſix or ſeven times in her way.

Ordered the ſyrup of white poppies, and an aperient draught.

April 12. Expectoration as before, ſleep very diſturbed, awakened with violent head-ach, and ſickneſs of the ſtomach.

Ordered an emetic and cathartic, and the opium to be omitted.

April 14. Brought off a quantity of viſcid mucus from the ſtomach, feels to-day lighter, and much mended. Expectoration as before.

Ordered a fleecy hoſiery waiſtcoat, a cathartic, and a mixture of bark, myrrh and ſteel, and the opiate to be reſumed.

April 16. Feels ſtronger, and only reſted once in getting here, complains of a tightneſs acroſs the breaſt, ſtitches in the ſide, much heat at night, giddineſs and head-ach, diſturbed ſleep, and cough very hard. Pain when making a deep inſpiration, and a catching of the breath.

Ordered the tonic to be omitted, and directed a tonic aperient of rhubarb quaſſia and coriander ſeeds to be taken at night, the bark mixture without ſteel to be reſumed the following day.

April 18. Is much mended. The expectoration is leſs ſtreaked, and appears now ſpotted with blood, and ſtudded over with air-bubbles. Sinks in water.

Ordered the tonic mixture to be repeated and the aperient each night.

April 21. Walked here without leaning on her companion, and only ſitting down once ; ſlight ſtiches in the expectoration as before. Repeat the medicines of yeſterday.

April 22, 23, 24, 25. Continues mending; expectoration diminiſhed, and rather leſs ſpotted with blood. Pains in the loins. Signs of menorrhœa. Omit. medicamenta.

April 26, 27, 28. Menorrhœa, pale, copious, during which time ſhe was unuſually well; but the expectoration was much ſtreaked with blood, and leſs ſtudded.

April 29. At nine in the evening was taken exceedingly ill; had violent head-achs, ſhiverings, fluſhes of heat, great pain in the loins, ſhortneſs of breathing, drought, no appetite; paſſed a bad night.

In getting here, May 1, was obliged to reſt four or five times by the way, looked exceedingly ill; expectoration more ſtreaked with blood, complains of ſome pain and rumbling in the bowels; ordered the tonic aperient, and the bark mixture after the bowels were cleanſed.

May 3. Sat down thrice in walking here: the expectoration was leſs ſtreaked and ſpotted with blood; and of a browner colour, and more diſpoſed to ſwim.

Ordered the bark mixture to be repeated, and the opiate at night, with a tonic aperient pill of aloes, gentium, myrrh, and ſteel.

May 4. Strength much increaſed, countenance more healthy, expectoration browner, not ſtreaked, and leſs ſtudded with blood, ſleep undiſturbed, cough eaſy, appetite good.

May 5, 6, 7, 8. Mends daily: expectoration very little ſpotted with blood, of a dark brown, and ſwims.

May 9, 10, 11, 12, 13, 14. Continues mending; has increaſed in fleſh; the medicines have produced a total alteration in her appearance, ſo that few would believe her to be the ſame perſon; ſeldom expectorates.

May 20. Has left off medicines, thinking herſelf quite well.

September 3. I learnt that Amy Chatfield has had no return of her diſorder, and has continued with ſame family in excellent health.

During the time Amy Chatfield was under my care, ſhe inhaled a quart of hydro-carbonate a day, diluted with 30 of atmoſpheric air, and felt at the time of inhalation a cool and ſoothing effect; and at firſt ſlight giddineſs and nauſea; but theſe ſoon went off. Theſe effects however were not ſo conſpicuous, as when ſhe inhaled the vapour of æther, which was employed five or ſix times. This produced little or no nauſea. It ſeemed to ſoften and enfeeble the pulſe; but, after the proceſs was over, it roſe, and appeared ſoft and fuller. As the air was drawn over a large reſervoir of cold water, did it not ſerve as a temporary cold bath, bracing the veſſels of the lungs?

London, Sept. 17, 1796.

SIR,

I PLACED myſelf under Dr. Thornton's care laſt June, being ſubject to hæmoptoe, and bloody and purulent expectoration ſinking in water. I had previouſly, without benefit, but rather with an aggravation of my complaint, tried the air of the country. I inhaled at Dr. Thornton's daily a quart of hydro-carbonate, mixed with thirty of common air. It produced at firſt conſiderable vertigo, and afterwerds much refreſhment and a pleaſing tranquillity. This was conjoined with the exhibition of bark and Columbo root, and I was evidently mending. When, at the commencement of Auguſt, the weather ſetting in extremely hot, I left off the reduced atmoſphere, but continued the tonic mixture: and, being rather hurried in buſineſs, I was in conſequence ſeized with conſiderable hæmoptoe. The ſubſequent attacks have, however, been trifling; having, by the direction of Dr. Thornton, at the inſtant immerſed my hands and feet into water, which was ſurrounded by æther, and a ſolution of ſal ammoniac in water; and then keeping them for ſome time in the air: after which I took aperients, and next tonics; and it is now three weeks, and I have had no returns whatever of hæmoptoe, nor is my expectoration ſtreaked or ſpotted with blood. The fever at night, and perſpiration in the morning, are, however, very oppreſſive; and having inhaled on the 6th current two teaſpoonsful of æther from a tea-pot, I remarked, with another gentleman, that my pulſe, which was about 98, ſunk at the time from ſix to eight beats in the minute,

nute, and continued throughout the night conſiderably leſs full, but equally quick as before. The ſubſequent effects of æther have been always to ſoften and enfeeble the pulſations.

I am, Sir, &c.

To Dr. Beddoes. WILLIAM COCHRAN.

* * *

Note on this Case.

IN the caſe of Mr. Cochran, an apothecary, living in Broad-ſtreet, Golden-ſquare, who had been for ſome months ſubject to hæmoptoe, which had terminated in purulent expectoration, ſtreaked with blood, the benefit from the hydro-carbonate was not equally conſpicuous: but here it ought to be obſerved, that anxious to do good, and advance himſelf in his profeſſion, during the time he was under my care, he purſued his avocations, and attending a labour at night, with other exertions, probably brought on a ſerious return of hæmoptoe: but he ſtill perſiſts in his deſire of the hydro-carbonate, convinced it had done him ſome ſervice; and two phyſicians, Dr. Underwood and Dr. Shaw, his intimate friends, whom I called in, approving of it, it will be reſumed. Mr. Cochran took no ſteel. The ſequel of this caſe I propoſe giving at ſome future time.

I am,
Moſt truly your's,

R. I. THORNTON.

CASE XXI.

Birmingham, Aug. 15, 1796.

DEAR DOCTOR,

I SEND you the following caſe of Pulmonary Hæmorrhage, wherein the effects of a medicated atmoſphere appear to me to have been deciſive. The factitious air was prepared and given by James Watt, Eſq. of Heathfield; with whoſe intimate knowledge of this branch of medicine you are well acquainted.

Richard Newberry, aged 46, a labourer; of a tall and ſlender make, ſanguine temperament, and who, previous to the attack which I ſhall deſcribe below, enjoyed good health, was, about the beginning of the month of May laſt, in conſequence of repeated intoxication* and expoſure to cold, ſeized with hæmoptyſis. I ſaw him ſome days thereafter; when he complained of pain in his ſide, and cough, attended with copious expectoration of frothy mucus, for the moſt part mixed with blood, which was dark and grumous, but at times of a florid colour. His pulſe was frequent, and had ſome degree of hardneſs; his tongue was white, and he had conſiderable thirſt; his bowels were regular, and his appetite much diminiſhed. For ſeveral evenings after the firſt attack, Mr. Watt, whoſe ſervant he is, gave him a pint of hydrocarbonate, properly diluted; and which he uniformly inhaled, with the evident good effect of diminiſhing the heat of his body, and of rendering his pulſe ſoon after both ſlower and ſofter. By this treatment the pain in

his

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* Naturally of a ſober turn.

his ſide, and cough were ſo much mitigated, as to ſuffer him to paſs his nights in ſleep; but, as the pain returned with increaſe in the morning, accompanied by more frequent cough, I directed that a bliſter ſhould be applied to his ſide, and that every four hours he ſhould take, in the form of a pill, a mixture of ſquill with a ſmall proportion of ipecacuanha, and that the modified air ſhould be continued. The pain of his ſide was much relieved by the bliſter, and did not afterwards return in the morning; but in the morning after its operation his pulſe was much increaſed both in ſtrength and frequency; and in that ſtate continued until the evening; when, as formerly, in both reſpects it was much diminiſhed by the repetition of the hydro-carbonate. The proportion of modified air was now increaſed to a quart every evening, and continued to occaſion, during the inhalation, a grateful ſenſe of warmth in the breaſt, and ſlight vertigo; and in the nights to produce ſound and refreſhing ſleep. After this manner he proceeded; the expectoration becoming evidently purulent and offenſive, but gradually leſs mixed with coagulated blood: when, about fourteen days from the date of the firſt hæmorrhage, having been employed in threſhing out ſome corn, the hæmoptoe returned in conſiderable degree, preceded by the uſual ſymptoms of fluſhed cheeks, ſenſe of weight in the breaſt, with ſome degree of pain, accompanied by a hawking cough. Mr. Watt, judging by the former beneficial operation of the modified air, and finding his pulſe upon this occaſion very ſtrong and quick, and his ſkin very hot, increaſed the proportion of hydro-carbonate to two quarts, with the moſt ſtriking advantage; his ſkin ſoon thereafter becoming cooler, and his pulſe much ſofter and ſlower. He paſſed a good night; but in the morning, when I ſaw him, he complained, as at firſt, of his ſide, coughed frequently, and expectorated blood in conſiderable quantity. As a bliſter formerly had removed his pain, I directed another to be applied to his ſide, which had a ſimilar good effect; and that he ſhould continue the uſe of the ſquill and ipecacuanha pill, but in an increaſed doſe. On the third day after the ſecond hæmoptoé, an eruption of the ereſypelatous kind ſpread itſelf over his right thigh and leg; which induced Mr. Watt to augment the quantity of factitious air to three pints, twice a day. The diſcharge of blood ſoon ceaſed, and the expectoration again aſſumed the purulent appearance and offenſive ſmell above deſcribed. In a few days the eruption diſappeared, and the ſecretion of the lungs looſing its fetor, was expectorated in uſual quantity and of its natural quality. He continued a few days ago in perfect health.

On the foregoing caſe I ſhall only obſerve, that Newberry himſelf uniformly expreſſed much thankfulneſs for the benefit he invariably received from breathing hydro-carbonate. Had the inhalation of the modified air been repeated more frequently, would it not alone have been adequate to the complete removal of the pain of his ſide, and conſequent cure? As the ſquill and ipecacuanha pills never produced any ſenſible alteration, much cannot be attributed to them in the ſucceſsful reſult.

I remain moſt ſincerely your's,

To Dr. Beddoes. JOHN CARMICHAEL.

CASE XXII.

Letter from Mr. CHAMBERLAIN, *Apothecary, to Dr.* THORNTON.

Aylesbury-ſtreet, Clerkenwell,
SIR, *Sept.* 25, 1796.

I CANNOT heſitate in the leaſt ſending you the ſtatement you require. I do not think it poſſible, that you could have a caſe of Phthiſis pulmonalis more ſtrongly marked, than that of my patient Wm. Roberts; of whoſe ſituation, prior to his happy application to you, the following is a juſt account. On the 14th of November, 1796, when he firſt applied to me, he complained of heat, pain, and oppreſſion about the ſternum; he had a hard and hollow cough, and the expectoration was ſalt, greeniſh, and uſually tinged with blood. I gave him a gentle emetic, and treated him in the uſual way with expectorants, lac ammoniacum, myrrh, and the different preparations of ſquills, with anodynes occaſionally interpoſed; but, in ſpite of every effort on my part, he daily grew worſe; till at length he became ſo bad, that his emaciated body, hollow jaws, hectic fever, night ſweats moſt profuſe, eyes ſunk in his head, with total loſs of ſtrength, and exceſſive coldneſs of his feet and legs, ſeemed to indicate approaching diſſolution; and, with ſo much apparent certainty, that I adviſed his wife to prepare for the worſt; and even warned the patient to ſettle all his worldly affairs, as his danger was great. He in conſequence left off medicine, and reſigned himſelf wholly to an event, which I thought inevitable; when he fortunately heard of you, and of your ſurpriſing ſucceſs in a caſe*, which appeared nearly as bad as his own. He next day, in conſequence, rouſed himſelf ſo far as to get to your houſe; but he fainted away upon his return home. His wife brought me the preſcription; when I candidly tell you, I ſaid, " It is to no purpoſe, for neither Dr. Thornton with his airs, nor the whole college of phyſicians, with Sir George Baker at their head, can ſave your poor huſband." But he had not been a week under your judicious management, when the alteration produced was a matter of the greateſt aſtoniſhment, both to myſelf and others. I need not contraſt his preſent altered ſituation, and the great benefit unequivocally derived from your practice; as you mention you propoſe ſending yourſelf an account to Dr. Beddoes. I have the honour to ſign myſelf, therefore,

Sir,

With the ſincereſt reſpect, &c.

WILLIAM CHAMBERLAIN.

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* This was the caſe of Mary Kimber, recorded by Mr. Townſend in his Guide to Health, Vol. II. p. 274; who was recovered principally by means of the vital air, after her phyſician, Dr. Myers, had pronounced ſhe would not live a fortnight. She has now remained above ſix months in perfect health and ſpirits; nor has ſhe the ſmalleſt ſign at preſent even of indiſpoſition. Knowing the forlorn ſtate of the child, when I heard of the recovery, I went to the parents, that I might have ocular demonſtration; and am happy to bear teſtimony to ſo extraordinary a fact. The caſe of this child was however very different from that of Roberts, as it was confirmed aſcites.

Journal

Journal of Mr. ROBERTS'S *Case.*

March 15. William Roberts, aged 34, married, caught a moſt violent cold in November, 1795, which ſettled in the breaſt; accompanied with acute pain on the right ſide, difficulty of breathing, expectoration ſtreaked with blood, a hard cough; for which he was bliſtered, and the uſual antiphlogiſtic remedies applied. It ſoon after terminated in phthiſis, viz. hot and parched ſkin in the evening, profuſe perſpiration in the morning, drought, chillineſs in the day, debility, emaciation, and purulent expectoration. He conſulted Dr. Wills, phyſician to the Finſbury Diſpenſary; who, after attending him for ſome time, declared to his wife, that no medicine could be of any ſervice, and that he was in a deep decline, and his only hope was his going into the country. He then conſulted Mr. Myers, who was of the ſame opinion; and, having next applied to Dr. Pitcairne, he alſo told him, medicine would render him no ſervice, and he muſt go into the country.

Ordered an emetic, and tonic cathartic of rhubarb and vitriolated kali; and, after their operation, a tonic mixture of bark, compound tincture of the ſame, and myrrh.

March 17. Cough hard and troubleſome.

Ordered another aperient.

March 19. Cough more urgent.

Ordered an emulſion of oil of almonds, milk of almonds, ſugar and gum arabic; ſyrup of poppies at night; and the tonic mixture to be reſumed.

March 20. Strength increaſed; the night's ſleep leſs diſturbed; cough leſs urgent, coſtive.

Ordered a tonic aperient pill of aloes, myrrh, vitriolated iron, and extract of gentian. The other medicines to be taken as before: a Burgundy pitch plaſter to be applied to the ſternum.

March 21 to 25. The tonic pills and opiate were ordered to be omitted.

March 26. Cough urgent.

Ordered the opiate to be reſumed.

March 27 — 30. Cough leſs troubleſome; ſtrength increaſed.

Ordered the ſame medicines to be continued.

April 1. Strength conſiderably increaſed: ſaid, he "walked ten miles in three hours," and has returned on foot from Woolwich, and felt no fatigue.

April 2. Expectoration diminiſhed, perſpiration leſs profuſe, appetite keen.

Ordered the ſame medicines to be continued.

April 3—14. Amendment great. Expectoration not ſtreaked with blood, but ſtill ſinks in water.

April 18. Walked from Woolwich this morning, and ſaid he felt neither fatigue in going there or returning.

Ordered vitriolated iron and extract of bark, to be taken with the tonic mixture. The opiate and emulſion to be omitted.

April 25. Night ſweats wholly gone, only a ſlight cough in the morning; what he expectorates, when immerſed in water, ſwims; except ſome ſmall pieces, which detach themſelves upon agitation; nights good, ſpirits alert; for ſeveral months had been obliged to leave off his trade; now follows it with ſatisfaction to himſelf; ſays, he " ails nothing now but a ſlight cough."

Ordered the tonic medicines gradually to be left off.

April 30. Appears light and active, has acquired fleſh, ſpirits great, appetite good, coughs but ſeldom, has however hecking occaſionally.

Ordered the medicines wholly to be left off, and now and then a little gum Arabic to be put into the mouth.

Sept. 29. Saw Wm. Roberts; he has the appearance of health, and ſays he has enjoyed good health ſince his recovery. Adviſed him to ward againſt the autumn by a fleecy hoſiery waiſtcoat.

Obſervation. From the copious expectoration of this patient, I conceived he had a catarrhal defluxion from the lungs, local irritation, and general debility. To take off the local irritation he inhaled a reduced atmoſphere, formed of the hydro-carbonate a quart, to fifty of atmoſpheric air; and he had a Burgundy pith plaſter applied to the ſternum; and when inflammation was indicated, an aperient. The abſorbents were excited to action, firſt by an emetic, and probably by the hydro-carbonate and tonic medicines; which laſt tended alſo to counteract morbid debility and irritability. Theſe ideas however I only mention as ſurmiſes, referring the juſter explanation of cauſes to you who firſt ſuggeſted the means.

To Dr. Beddoes.

CASE XXIII.

Note reſpecting W. DENCH, *by Mr.* KNIGHT.

SIR,

THE bearer, who is in Mr. Benſley's employment, has been tormented by a violent cough for the laſt eighteen months. He has been under ſeveral medical men, but has derived no material relief; therefore I have taken the liberty to recommend his caſe to your conſideration, being perſuaded that you will be abundantly gratified if you can reſtore him to health.

I am, Sir,

Your's, &c.

To Dr. Thornton. J. KNIGHT.

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Journal of Mr. DENCH'*s Caſe, by Dr.* THORNTON.

May 10. William Dench, printer, married, aged 36, has been, for ſome months, ſubject to a violent cough; perſpirations in the morning, emaciation, debility, a dull pain at the breaſt, purulent expectoration, flocculent, and ſinking in water; which experiment was tried in his preſence; voice hoarſe, breathing oppreſſed, tongue clean, appetite moderate.

Ordered an emetic of ipecacuanha, and a cathartic of rhubarb and vitriolated kali.

May 12. Symptoms the ſame; feels rather weaker.

Ordered the cathartic to be repeated.

May 14. Leſs pain under the ſternum : rather weaker.

Ordered a tonic mixture of decoction of bark, compound tincture of the ſame, myrrh, and columbo; ſyrup of white poppies at night and in the morning.

May 15. Slight ſtitches in the ſide, ſickneſs at the ſtomach and head-ache.

Ordered a Burgundy pitch plaſter, and an emetic at night. The opiate to be reſumed the night after.

May 16 to April 8. Continued the opiate night and morning, and the tonic mixture in the day, with tonic aperients *pro re nata*.

April 9. Cough free, breathing eaſy; no profuſe perſpiration at night; upon going up ſtairs formerly obliged to reſt ten minutes before he could poſſibly proceed to work; now, to uſe his own expreſſion, he "has at it immediately;" appetite good, ſleep undiſturbed.

Ordered the ſyrup to be omitted.

April 16. Seldom expectorates, and what is coughed up appears to be chiefly mucus.

Ordered the tonic mixture gradually to be left off.

April 18. Came to me to return thanks, being, as he thought, *cured*.

Sept. 20. Has experienced no relapſe; looks well, and ſays "he feels very hearty;" he is ſubject, however, to catarrhs.

Observations on this Case.

Mr. Dench frequently inhaled, once a day, a reduced atmoſphere, and felt vertigo at firſt. The quantity was a quart of hydro-carbonate to thirty of atmoſpheric air. Upon diſſection I have often found ſigns of a *morbid ſecretion*, and no ulceration: and, where the expectoration is *copious*, may we not reaſonably ſuſpect this rather to be the caſe, than that what is coughed up is formed from an ulcer? Are not tonics indicated in diſeaſed ſecretions? and may not the hydro-carbonate give tone to the abſorbents? Is not the leucophlegmatic conſumption a diſeaſe of the abſorbents, often previouſly manifeſted by tumid glands, though theſe in an advanced period are rarely to be found?

* * *

CASE XXIV.

SIR,

I HAVE ſent you the encloſed, as drawn up by the Gentleman who was conſtantly with the patient. Having frequently ſeen this lady previous to the time I ordered the hydro-carbonate, I had but little doubt, but that the pain in the breaſt, hoarſeneſs, &c. were the precurſors of tubercles; for her habit is remarkably ſcrophulous; and, as a variety of means had been tried, I really conſidered the air as a forlorn hope. She has no doubt of its efficacy, and has continued to enjoy a perfect ſtate of health till this time.

Your's, &c.

To Dr. Beddoes. J. ALDERSON.
Sept. 26, 1796.

P. S. Mrs. B. always found the air to have no intoxicating effect if not taken immediately;* and that without that effect it procured no ſleep.

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* After being made, I ſuppoſe.——*Editor.*

Journal of Mrs. B———'*s Caſe.*

Mrs. B. about 34 years of age, ſcrophulous habit, ſubject to eruptions in the face; early in the ſpring of 1795, in the evening, complained of a ſlight pain in her throat, and ſome difficulty in ſwallowing; which increaſed ſo much before the morning, that it was with great difficulty ſhe could ſwallow a table ſpoonful of liquid; great pain in the throat and breaſt, a very hoarſe voice; ſpoke very low, and great pain in ſpeaking; a hot dry ſkin, pulſe 100, great thirſt.

Neutral mixtures, with ſpermaceti and opium, with bliſters to the back and breaſt, brought on a plentiful ſweat, and relieved the affections of the breaſt and fever in the courſe of a few days.

The ſweating continuing reduced her ſo much, that it was thought adviſable to give the bark to check it; the ſaline julep, with laudanum, was occaſionally given, to relieve the irritation of the breaſt, and to procure ſleep. She continued gradually to recover for about ten days. The pain in her breaſt and ſide returned, which was removed again by the ſweating being produced, which left her in a more reduced ſtate than before. The Anguſtura bark checked the ſweating: but within fourteen days the whole train of unfavourable ſymptoms again returned, with troubleſome aching pain in the extremities; and was again removed by ſweating. In a little time was able to go down ſtairs, and in fine weather to ride out in an open chaiſe; but ſeldom more than a mile at a time, which ſeemed to be attended with advantage. Yet, nearly about the ſame diſtance of time, i. e. about fourteen days, ſhe was attacked with all the unfavourable ſymptoms before mentioned. The Anguſtura bark was then changed for a decoction of the yellow bark, two ſpoonsful twice a day, and the following.

1ſt night. Pain in the breaſt, and ſide, and back; ſweat much in the night; in the day very languid, with frequent giddineſs in the head; often faint and ſick; took very little nouriſhment; pulſe 70; very weak; had but little ſleep for three nights.

Took, at going to bed, one quart of hydro-carbonate air, with reſting three times; complains of a ſlight giddineſs in her head.

2d. Had a better night; was faint and ſick; in the morning was able to ride about two miles in an open chaiſe; was better of her ſickneſs, the pain in her breaſt and ſide eaſier; had not ſweat ſo much the night before; pulſe regular; took one quart of the hydro-carbonate air, with reſting twice, and did not complain of any affection of the head.

3d. Slept tolerably well in the night, without any ſweating; was rather faint when ſhe awoke in the morning, with a ſlight giddineſs of her head; rode out about three miles; the affection of her head better, the pain in her ſide worſe; appetite better for her dinner; in the evening the pain in her ſide was better, and had been free from pain in her breaſt all the day; took in the evening three half-pints of hydro-carbonate air at three times, which affected her head very much; was not able to take more; the pulſe was about 100, and did not ſeem to be altered from the affection of the head by the air.

4th. Slept better; the pain in the ſide continued, the pain at her breaſt better; did not ſweat in the night, appetite better; pulſe 80; complained of heat in her hands and feet frequently, with giddineſs in her head for the courſe of the day; rode out about four miles; the affection of her head better; took three pints of the hydro-carbonate, which affected her head a little; took it at three times.

5th. Slept tolerably well; no ſweating; the pain in her breaſt and ſide better; pulſe 100; frequent fluſhings of heat in her hands and feet, and a little giddineſs in the head; rode out, and the affection of the head was better; took three pints of the air at three times.

6th. Reſted well; the pain in her breaſt and ſide better; ſweating entirely gone off; appetite better.

7th. In every reſpect from this time continued gradually recovering, and had not any return of the complaints; continued the uſe of the air for two months, and is at preſent better than for twelve months paſt.

20 *Sept.* 1796.

CASE XXV.

Accidental Cure of Consumption.

SIR,

I TAKE the liberty to incloſe you a newſpaper, containing an account of the nitric acid* on the human body; for, to whom can I addreſs myſelf ſo properly on ſuch a ſubject?

I am the author of this account, and I believe it is nearly a repreſentation of the truth. It may tend, I think, a little to advance our knowledge of the nature of ſome diſeaſes; and may perhaps lead to the introduction of a powerful agent for their cure. You may make any uſe of my name that you think is right in this matter: my name, I fear, is too little known to give it much authority. Another paper will ſoon appear on the ſame ſubject, in which I mean to take notice of ſome other effects of the nitric acid; 2dly, to deſcribe ſome attempts that I have made to get a ſubſtitute for it; and laſtly, my method of procuring the acid beſt fitted for internal uſe. This acid I procure by mixing three parts of uncalcined alum, with one part of nitre, and diſtilling by the uſual method.

I have lately met with a caſe that is a confirmation of your opinion regarding the phthiſis pulmonalis, and its method of cure. A lieutenant in the Bombay marine was lately, at Bengal, ſo ill of a complaint which every body believed to be a conſumption, that for a long time he

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* See the Appendix.

was incapable of doing his duty, and given over as incurable. In this hopeleſs ſituation it became neceſſary to him to proceed to Bombay. During the paſſage the bilge water of the ſhip got at ſome ſugar with which ſhe was laden; which, from its decompoſition, was ſuppoſed to have injured very much the purity of the air. Below decks the air certainly became very impure; which at firſt induced this gentleman to remain above: but he one day, on going down below, obſerved that his reſpiration went on much more eaſily than on deck. He ſoon fell into a ſound ſleep in this new ſituation; and from that time he remained below in this atmoſphere, from which he continued to feel relief. His health afterwards daily improved; and he is at this moment in good health, and doing his duty at ſea.

I remain, Sir, &c.

W. SCOTT.

Bombay, *May* 4, 1796.

Remarks on the effect of a dose of Hydrocarbonate Air, by *Mr*. GREENWOOD.

WEDNESDAY, the 5th of October, at three o'clock, inhaled four quarts of diluted hydro-carbonate air; about ten minutes afterwards, not having moved from the chair where I received it, I felt a numbneſs in my forehead, and a ſenſe of weight or heavineſs in the eye-lids. This was ſucceeded by a dizzineſs, accompanied with an uncommon faintneſs, as if the ſtomach and belly were an entire vacuum.

There happened to be within my reach a ſmall quantity of ſpiced wine. Of this I drank twice after the faintneſs came on. It cauſed a temporary relief. I then twice attempted to reach a ſopha, leſs than two yards diſtant; but, on riſing from the chair, found myſelf in danger of falling on the floor from extreme giddineſs. On this, I fixed myſelf as firm as poſſible in the chair; ſitting ſideways, with one leg to the front; and my forehead reſted in the bend of my arm on the back of the chair. In this ſituation I loſt all ſenſation; how long I cannot tell. During the ſtate of inſenſibility there was an involuntary diſcharge of urine. On recovery, felt great languor: therefore remained a few minutes in the chair. My ſiſters at that time came into the room, and, as they afterwards informed me, were alarmed at ſeeing my face quite pale, and lips blue. They haſtened to me, and caught me; for at that inſtant I fainted. The remaining part of the day I was languid and weak: the night full as good as uſual: the expectoration leſs copious. Next day, what difference there was, was for the better; and nothing diſagreeable afterwards followed.

I muſt remark, that on Wedneſday, the 21ſt of September, I had begun to take four quarts of hydro-carbonate air, equally diluted, three times a day; and that on Monday and Tueſday, (the 29th and 30th) I took five quarts twice a day. Prior to that, I had been taking from two pints gradually up to five quarts, without much *ſenſible* effect. After this alarm, it was enquired, whether the air was recent or not. The man who adminiſtered it, was poſitive it was air of ſeveral days ſtanding; but, as he had brought an airholder of freſh hydro-carbonate, with intention to take away another that was full, what I took might have been new made. An attempt was not made to aſcertain the fact till my phyſician came; and then, on account of the change of the airholders, no fact appeared, either to confirm the aſſertion of the man, or otherwiſe.

Oct. 13, 1796. JOHN GREENWOOD.

REMARKS

ON THE

PRECEDING CASES,

BY

THE EDITOR.

REMARKS.

AMONG the preceding caſes, that of Newbury (Caſe XXI) deſerves to be diſtinguiſhed. Mr. Watt, who exhibited the hydro-carbonate,* Dr. Carmichael, and Mr. Barr (as I learned from their converſation) were much ſtruck by its effect in lowering the pulſe, and mitigating the very alarming ſymptoms that attended the diſcharge of blood. I applied to Dr. Carmichael for more minute particulars reſpecting the pulſe. His anſwer was as follows; "I find it impoſſible to make you any ſatisfactory return to your enquiry reſpecting Newbury's pulſe, further than, that the firſt time he inhaled the diluted hydro-carbonate, it was rendered ſlower by ten pulſations in a minute. I give you this on the authority of Mr. Barr, who happened to be preſent at the firſt trial. I never ſaw him ſooner than twelve or fifteen hours after the inhalation, otherwiſe ſhould have particularly ſpecified the quantity and quality of the pulſations."

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* Mr. Watt informed me, that this gas was prepared from one part in bulk of caſt-iron borings, and three of charcoal. It was ſo ſtrong, that, when freſh made, N. could not bear above a quart at a doſe.—Mr. Watt's queries on this caſe were, 1ſt. Could the iron do any thing? 2. Does not the caſe furniſh a hint, that copious eruptions upon the legs would be of uſe? 3. And might they not be produced by frictions with flour of muſtard, cowhage, &c.? The editor had this year a conſumptive patient, on whoſe body a copious progeny of boils broke out in long-continued ſucceſſions, but without any change in the ſymptoms.

Mr. Watt, in a letter, dated Aug. 17, 1796, informed me, that Mr. Barr counted Newbury's pulſe in the firſt fever fit, and made it 100; and that it fell to 90 "*during the time he was taking the firſt pint of hydro-carbonate.* The ſecond, or threſhing fever, I could not count it; but ſuppoſe it to have been at leaſt 120, and ſtrong! In about three days it was got nearly natural, and the eruption appeared. In the interim, he had three pints of hydro-carbonate twice a day."

In caſes like this I ſhould adviſe hydro-carbonate air with conſiderable expectation of advantage. But we ſhall not ſoon have a ſufficient number of facts to determine its virtues ; as conſiderable hæmorrhage from the lungs, with ſtrong pulſe, is a diſeaſe rather unfrequent : and it is ſtill more uncommon for a phyſician to be called in, till ulceration of the lungs, the formation of new veſſels, or the power of habit, has altered the nature of the complaint.

In the caſe of the late Mr. Gray, editor of the Morning Chronicle, whoſe fortitude under his ſufferings I had an opportunity of admiring during the laſt week of his his life, I made a ſingular obſervation. After various other complaints, he had been for ſeveral weeks ſubject to occaſional pulmonary hæmorrhage, and to almoſt conſtant hæmoptoe. One morning I was haſtily called to him, and arrived before he had diſcharged from his mouth the laſt of about a pound of blood. On taking the baſon from his hand, I ſaw that the coagulated maſſes, which were numerous, had taken a ramified or digitated form. The branches were of various diameters, from a crow-quill to a hair. On waſhing, I perceived that the coagulated lymph had encloſed numerous air-bubbles, and ſome red particles. The appearance of air-bubbles was perfectly diſtinct. Dr. Craufurd, ſurd, of Briſtol Hotwells, to whom I ſhewed the coagula, perceived them perfectly. The air-bubbles, and the fineneſs of ſome of the fibres, prove that the blood coagulated almoſt inſtantaneouſly after its effuſion into the air-cells. I do not ſee that the fact ſuggeſts any uſeful concluſion. But the propriety of recording unuſual phænomena, when they can be completely aſcertained, is acknowledged.

On the foregoing caſes of conſumption, in which hydro-carbonate was uſed along with powerful drugs, it is obvious to remark, that the drugs would not of themſelves have produced the effect. Should the favourable event, as it reaſonably may, occaſion ſcruples reſpecting the real nature of the complaint, it is to be obſerved, that, in general, the account of the ſymptoms is very preciſe, and the expreſſions very pointed. A perfectly impartial practitioner, for inſtance, ſays, that he does not think it "poſſible phthiſis pulmonalis could be more "ſtrongly marked than in W. Roberts."

From ſuch reports, I infer only, that it may be proper *cautiouſly* to adminiſter hydro-carbonate, or other factitious unreſpirable air in conſumption, two, three, or four times a day, till either ſome remedy of a different nature be diſcovered, or ſome better method of employing theſe ſubſtances be rendered practicable. I procured Mr. Greenwood's obſervation on himſelf to enforce caution. The relaxation of the *ſphincter veſicae*, and the univerſal reſolution of the muſcles, ſeem to confirm what has been ſuggeſted concerning the probable utility of hydro-carbonate in ſtrangulated hermia. It ought alſo to be tried in tetanus. If advantage be taken of theſe accidents, I doubt not but the trouble of the preſent inveſtigation will be compenſated by collateral benefits, though the original purpoſe ſhould not be attained. The only other example of a diſagreeable effect produced upon a patient of my own, that has ever occurred to me from this claſs of airs, is the following. A perſon, far advanced in conſumption, had his hydro-carbonate increaſed from one pint to two quarts. He took two quarts in the morning in bed without any unpleaſant feelings. He took two quarts in the evening, alſo in bed; and, after ſleeping about twenty minutes, awaked with a violent head-ache, ſucceeded by ſome delirium. His hectic fever ran higher than uſual in the night: it was aggravated, I ſuppoſe, by the head-ache, which was doubtleſs owing to the hydro-carbonate. Next day, he was very little worſe than uſual, and afterwards better. The air was the ſame morning and evening.

I have occaſionally ſeen good ſleep from very moderate doſes of hydro-carbonate. Miſs S. daughter of Dr. S. conſtitutionally very feeble, and in the laſt ſtage of conſumption, after taking a quart of hydro-carbonate, could ſleep ſixteen hours out of the twenty-four without medicine. She felt no head-ache or other inconvenience. This effect continued, with ſome abatement, for a week; when ſhe went from the Hotwells. I have lately received an account of the ſimilar operation of an over doſe of hydro-carbonate. " A woman, aged —, had been afflicted with a cancerous ulcer for more than ten years, the pain of which deprived her of ſleep almoſt compleatly; at leaſt her ſleep was neither ſound nor refreſhing. She was treated with oxygene, which had ſome good effects. *I believe,* hydro-carbonate was alſo tried, of which, accidentall , ſhe got one day a large doſe, which brought on ſyncope and deliquium, which laſted a conſiderable time. When ſhe recovered, ſhe was put to bed, and ſlept ſound many hours. Next day ſhe ſaid ſhe had been in paradiſe, and that all the ſleep ſhe had had for ten years put together, did not amount to ſo much as ſhe had had this laſt night, and the pain of the cancer continued eaſier throughout that day. The event of the caſe I have not been informed of, but believe there was no cure."

Continued reflection, and information from various quarters, lead me ſtill to expect, that we ſhall arrive at a method of treating conſumption ſucceſsfully. All the great attempts, in which human genius has ſucceeded, were taxed beforehand as preſumptuous follies. *Le vulgaire de chaque siecle cite avec emphase le* PASSE *contre* L'AVENIR : *celui qui succede le voit dementi par l'evenement ; mais en insultant a son erreur il l'imite, et deplaçant seulement ses negations, il n'en poursuit pas moins infatigablement ses proscriptions prophetiques.*

If, on the one hand, we need not be thrown into deſpair by the *anticipations* of prophets, not critically verſed in the preſent and the paſt ; we may, on the other, diſcover grounds for hope, without placing any reliance on ſpeculation ; for, in conſequence of being placed in uncommon ſituations, ſome conſumptive patients appear clearly to have recovered. Mr. Scott's communication is an example of this kind. — In many countries *cow's breath* is a traditionary remedy ; and patients may occaſionally have been indebted to it

for

for a reſpite from their fate. Dr. R. Pearſon, of Birmingham, produced from Dr. Bergius one inſtance, in which a lady, in the laſt ſtage of conſumption, had her diſtreſſing ſymptoms all removed, from living the winter in a room with four cows. In September ſhe had cough, expectoration, complete hectic fever, and ſwelled feet. She experienced gradual amendment. By Chriſtmas her pulſe had become natural. In ſummer ſhe gained fleſh; the catamenia returned; ſhe had only a ſlight cough, and breathed quickly when ſhe walked. The next winter ſhe refuſed to paſs her nights with cows. In ſpring ſhe caught cold, and was again phthiſical; in autumn ſhe perſiſted in refuſing to return to her firſt plan, and died at the end of winter. Far advanced conſumption, in ordinary circumſtances, never obſerves ſuch a courſe; nor is there any known medicine capable of removing hectic fever, cough, and expectoration, accompanied with œdema and diarrhoea for a week; much leſs for two winters and a ſummer. Lately, while I was preparing to repeat this intereſting experiment, I obtained the following communications.

Clifton, Oct. 17, 1796.

DEAR SIR,

UPON your mentioning to me that you were about to try the effect of the breath of cows in conſumption, it occurred to me that I could procure you the caſe of a French Lady, with whom I have the honour to be well acquainted, which proves that the experiment has been ſucceſsful. She conſents to its being made public; and

gives you leave to refer any perſons to her, who may be really intereſted in procuring further information on the ſubject.

I am, dear Sir,

Your's very ſincerely,

J. HARE.

To Dr. Beddoes.

APRES une fauſſe couche de trois mois, pendant laquelle je me ſuis fort peu ſoignée, et dont il m'etoit reſtée une perte de ſang conſiderable pendant pluſieurs ſemaines ; j'ai tombé *en conſomption.* Cela a commencé par une petite toux ſêche avec une fievre legère, et que je negligeois ; continuant toujours de ſortir : de me coucher tard ; *et en tout* de vivre d'une maniere trop active et trop agitée pour la ſituation de ma ſanté : qui de jour en jour devenoit trop mauvaiſe. Enfin je crachois le ſang mélé de matiere purulente ; mes jambes s'enfloient, et mes *epoques* etoient quaſi tout-a-fait diſparues, et le peu qui en paroiſſent étoit de la plus mauvaiſe *espéce.* Je ne dormois plus, et étant auſſi mal qu'on peut l'étre, alors pluſieurs conſultations des premiers medecins de Paris avoient lieu ; et il en reſultoit qu'ils regardoient le mal comme trop avancé pour pouvoir eſperer me guérir. Ils ordonnoient le lait d'aneſſe et l'exerciſe a cheval, ce qu'alors je n'étois plus aſſés forte pour entreprendre. J'avois 19 ans, et je ſentois ma fin arriver avec beaucoup de chagrin. Dans le tems que je me pleurois, je reçevois la viſite d'un ami à moi M. le Marquis de Voyez d'Argençon, homme de beaucoup d'eſprit : qui tout en s'affligeant avec moi, me dit, prenés mon conſeil ; puiſque toute la faculté vous abandonne, abandonnée; laiſſés moi vous amener un homme, qu'on traite ici de charlatan, parcequ'il n'eſt pas connu ; mais qui dans mon opinion eſt un homme de mérite. Il me l'amena. Je crachois le ſang par lambeaux, et j'avois une fievre ſi forte et une douleur ſi profonde, que je lui tendois les bras, en lui diſant : Ah ! s'il en eſt encore tems, *sauves moi*. Il me promettoit de faire tout ce qu'il dependroit de lui : mais je l'entendois dire *tout bas* qu'il etoit bien tard, ce qui ne diminua pas ma fievre. Il me fit jurer de faire tout ce qu'il voudroit, quelques ſouffrances que je duſſe éprouver. Je l'aſſurai d'une parfait obeiſſance, et je lui ai tenu parole. Il me mit malgré ma fievre dans un bain tied, tout prés de mon lit. J'y reſtai trois quarts d'heure ; ce qui me calma beaucoup : on me remit dans mon lit beaucoup plus tranquille, et j'eus quelques heures de ſommeil, qui me perſuaderent que j'étois deja beaucoup mieux. Le lendemain matin il m'appliqua ſur la poitrine un veſicatoire de ſix pouces de long par quatre de large, qui me fit beaucoup ſouffrir et eut fort peu d'effet. Mon exceſſive maigreur le rendant beaucoup plus douloureux, il le changeat et le plaçat entre mes deux epaules ou je l'ai eu 4 mois. Ne trouvant pas qu'il en eut l'effet deſiré, il m'ordonnat l'habitation d'une etable avec *trois vaches* ; ce qui fut executé en moins de 24 heures dans une remiſe à voiture appartenante à ma maiſon. On perça une fenetre et on y conſtruiſit un attelier pour 3 vaches. Une balluſtrade en bois à hauteur d'appui etoit tout ce qui me ſeparoit des vaches : mon lit etoit placè ſur un plancher a un pied de terre pour laiſſer couler deſſous les immondices. Il etoit de planches qui joignoient fort mal afin que la vapeur fut plus forte : et elle l'etoit *a tel point* qui tout ce qu'on portoit de blanc devenoit rougeatre dans fort peu de tems. Mon logement dans la longueur de la remiſe etoit ſeparé en deux piéces ; celle que j'habitois *aſſes grande*, dans laquelle etoit *un lit* ſans rideaux, entouré d'une couſiniere *de gaze*, comme celles dont on ſe ſert en Italie pour le meme effet, qui eſt de ſe preſerver des mouches, qui ſont toujours nombreuſes dans les etables et inſupportables ſurtout quand on ſouffre. Une table de bois ; deux chaiſes de paille ſans couſſins, les ſimples murailles ; voila quelle étoit ma chambre. Elle etoit precedée d'une petite pour la femme qui ſoignoit mes vaches. Mon chirurgien et ma femme de chambre logeoient au deſſus de mes remiſes. Il y avoient dans mon lit deux ſonnettes differentes pour les avoir à volonté. Là j'ai reſte *neuf mois ſans relache*, à l'exception de quelques promenades dans ma voiture entourée d'oreillers, et les chevaux n'allant qu'au pas ſur le pavé a cauſe des ſecouſſes que me faiſoient ſouffrir le martyre. J'oubliois de dire que mes veſicatoires, n'ont jamais rendu de *matiere* que dans *l'etable*, mais qu'il falloit pour les entretenir et les conſerver, les ranimer tous les deux ou trois jours dans le commencement. Ce qui m'affoibliſſoit beaucoup, mais l'eſpoir de guerir rélévoit mon courage, deja je crachois moins de ſang, enſuite les crachats n'étoient que *teints*, après la matiere devenoit tous les jours moins epaiſſe. Les jambes ont ceſſé de s'enflér apres 8 jours d'etable. *Le premier mois* a paru regulierement mais en petite quantité, le ſecond un peu plus *abondant*, et de mieux en mieux *tous les autres*. Des l'inſtant que je ſuis entrée dans mon etable, j'ai quitté tout eſpece d'aliment autre que du lait. Celui d'aneſſe à 5 heures du matin ; qu'auparavant j'etois obligé de couper avec de l'eau de Seltz pour le faire paſſer ; et qui dans l'etable paſſoit ſans aucune *aide*.

On m'apportoit à reſpirer, *matin et soin*, la jarre de lait frais qu'on venoit de tirer des vaches. Toute la journee *j'en buvois*, et le ſoir je prenois ordinairement du ris au lait bien crème et bien cuit; *rien autre choſe.* Je n'ai jamais gouté meme *le pain* pendant neuf mois, j'avois le bonheur de ne rien deſirer. On venoit me voir comme objet de curioſité, et on me trouvoit ſi changé, qu'on croioit que c'étoit fait de moi. Madame la Ducheſſe d'Orleans eſt venu me voir, et apres ma gueriſon, c'eſt elle qui a recommandé au Duc, le Dr. Saiffert, ce qui lui a fait faire ſa fortune. Du moment que j'ai été retablie. tout le monde a voulu l'avoir, et generalement on s'en eſt bien trouve. Mais je dois dire quel ſoins il me rendoit. Tous mes panſements ſe faiſoient par lui, on ſous ſes yeux: il me viſitoit quatre et cinq fois par jour, pour me conſoler et m'engager a ſouffrir avec patience: enfin il m'a ſauvé, et je n'ai perdu a cela, que mes cheveux, qui tomboient tous, et qu'il m'a fait raſer. L'obligation de me faire reparer mes dents de devant, que pendant mes ſouffrances j'avois negligé, et la defenſe abſolue de plus jouer de la harpe: d'avoir conſervee la reſpiration fort courte. Mais qu'eſt ce que tout cela en comparaiſon de la vie? J'étois pluſieurs mois a refaire mon eſtomac aux aliments ordinaires; et c'eſt avec de la chou croute preparé et bien ſimplement pour mon diner; et un peu de Chinchina dans du vin le ſoir, et de la teriacque de Veniſe, qui je ſuis parvenue a le retablir parfaitement. Mes nerſs ont été irrités bien long tems; mais tout cela s'eſt paſſé en moins d'une année, et je ſuis devenue une femme tres forte. Les deux grandes recommandations de mon medecin apres ma gueriſon *etoient*; évitez la ſaignée et les rheums; ce que j'ai fait le plus poſſible; mais ce climat eſt humide, et

malgré mes precautions, j'ai été aſſujettie à pluſieurs, au moment ou j'ecris ceci j'en ai une tres fort, avec un veſicatoire ſur la poitrine. Aujourdhui j'ai trente-ſix ans. Je ſuis moins forte qu'à 19, et malgré cela je me tirerai d'affaire. Des calmants; du lait d'aneſſe; une veſicatoire qu'il ne faut pas trop forcer parceque cela irrite: point de vin ni de thé; beaucoup d'eau d'orge coupé avec du lait un œuf, frais *au jour* pris à jeun; l'exercice du cheval en bon air. Je ſuis bien convancue qu'avec ce regime la, on ſe tirera toujours d'affaire: quand la toux eſt forte il faut toujours humecter. Une gorgée d'eau d'orge ſuffit: cela n'empate pas comme tous le ſyrops et je m'en ſuis toujours bien trouvé. Il ne faut pas negliger dans la preparation des veſicatoires de mettre beaucoup de camphre et d'opium, afin qu'ils irritent auſſi peu que poſſible.

In anſwer to queſtions propoſed by the editor, the ſame lady wrote:

Pour repondre aux queſtions de votre ami Docteur B. je puis l'aſſurer que j'avois des ſueurs preſque toutes les nuits, et des friſſons plus on moins legers ſuivis de chaleurs plus on moins fortes, que j'ai conſervé aſſés longtems dans mon etable, et dont je ne me ſuis debarraſſée que par le ſuccés de ma veſicatoire.

It may be aſked why, after ſo brilliant a cure, the ſame method was not further proſecuted at Paris; and the knowledge of its efficacy, if it proved effectual, ſpread over Europe. They, who have that knowledge of human nature which the practice of medicine confers, will be ſenſible of the difficulties attending ſuch an undertaking. For myſelf, I doubt not of being able to overcome them finally: but I have oftener than once been defeated by external circumſtances, when the patient, and the patient's friends, were deſirous that the trial ſhould be made.

I ſhould make a number of obſervations upon the French narrative; if it were not prudent to aſcertain facts, before their analyſis is attempted. I think it probable that the cow's breath was not eſſential to the cure. The patients, both in Sweden and France, were expoſed to various vapours ariſing from animal ſubſtances, as they underwent chemical changes: and I ſuppoſe that the conſtant action of ſome of theſe gave the pulmonary ulcers a diſpoſition to heal. If this ſuppoſition were true, nothing would be more eaſy than to imitate the experiment without the trouble and expence of the cows. The equal temperature, kept up by theſe animals, might have been an advantage.

MISCELLANEOUS CASES.

MISCELLANEOUS CASES.

CASE XXV.

Of Dyspepsia.

MARY HODDER, aged 39, lives a ſervant to Mrs. Godfrey, No. 74, Piccadilly; has for ſeven years laboured under ſickneſs at the ſtomach, frequent retchings, great heat and pain at the pit of the ſtomach, and fluſhings of the face after eating; drowſineſs, a briny water would often flow into the mouth, emaciation, great debility, horrid dreams, often waking in exceſſive fright, and commonly with a dull head-ache. She would faint away after any uneaſineſs and fatigue, and remain for five or ten minutes like a dead perſon; feet and legs extremely cold, ſubject to flatulence, extremely coſtive, ſight impaired; and, on account of her ill health, ſhe was obliged to leave three places. She was turned out uncured twice from the Hoſpital, and once from a Diſpenſary; and had tried private practitioners without benefit. Of late the ſymptoms of her diſorder had rather increaſed; when ſhe began the inhalation of the vital air. In three weeks, by the power of this remedy, conjoined with emetics, cathartics, bark, and ſteel, ſhe became perfectly free from ſickneſs, appetite returned, ſleep was undiſturbed by frightful dreams, perſpiration reſtored, a genial glow in the extremities, countenance became healthy, and ſtrength ſo far increaſed, that ſhe feels herſelf perfectly adequate to her preſent ſituation. The air has been left off, and the amendment continues. The quantity of air inhaled daily, was ſix quarts of vital air to thirty of atmoſpheric air.

CASE XXVI.

Corpulency, accompanied with Dyspepsia.

Mr. ASKINS, a ſmith by trade, married, aged 36, was always inclined to corpulency, latterly has become bloated, has frequent heartburn, diſturbed ſleep, flatulency, no appetite, lethargic, coſtive, with depreſſion of ſpirits, and an inability to work; which however he endeavours to accompliſh for the ſupport of his family, ſitting up to a very late hour. This diſorder has been increaſing on him for three years paſt. He had been under Dr. Duvallengin's care for ſix weeks, and had lately tried bark, myrrh, and ſteel, for a month; but the ſymptoms continued nearly as before. His complexion was exceedingly ſallow; and in coming to me from his houſe, No. 48, in the Old Bailey, he was at firſt above an hour and a half; owing to his being exceedingly ſhort-winded, if I may be permitted to uſe his own expreſſion. All theſe ſymptoms appeared to me to denote a deficiency of oxygene in the blood, or a ſtate of ſcurvy. Having therefore premiſed an emetic and calomel cathartic, which brought away a great quantity of ſlime, I ordered him a ſolution of nitre in vinegar, which produced all the good effects ſo accurately deſcribed by Mr. Patterſon in his treatiſe on the ſea ſcurvy; and in a fortnight he came to return me thanks for his cure, with ſuch an altered appearance, that it could not fail to ſtrike every one preſent; and he had walked to me in leſs than twenty minutes.

Observations on this case by Dr. THORNTON.

I. As the nitrous vinegar reddens immediately the black blood out of the body, may we not thence argue, it probably produces the ſame effect in the body; and does not this caſe tend much to confirm this opinion?

II. I am trying this remedy in aſthma, chloroſis, putrid fever, the ſecondary ſtage of the ſmall pox, a moſt deplorable caſe of leproſy; and, from my ſhort experience with this new power, firſt ſuggeſted by your theory of diſeaſe, it ſeems to promiſe to be an uſeful article in the materia medica.

III. The preſcription I uſually give, is two drachms of nitre to ſeven ounces of diſtilled vinegar; two table-ſpoonsful of which is to be taken every ſix hours, as the bowels may permit.

CASE XXVII.

Nervous Head-ache.

In March, 1793, Mr. Monier, who lives at Mr. Higgins's, No. 38, Southampton-ſtreet, Covent-garden, applied to me for a violent nervous head-ache, accompanied with ſtupor, and frequent giddineſs; which nearly incapacitated him from all buſineſs, and had continued unremittingly for above ſix weeks. His countenance was pallid; his eyes devoid of ſpirit; his feet cold; his pulſe ſcarcely ſixty; his reſt bad; he had no appetite; or, in one word, to uſe his own expreſſion, the head-ache had wholly *unmanned* him. I ordered him an aperient draught; and then adminiſtered the vital air in a ſtate of much dilution; and in a week he was reſtored to perfect health, in which ſtate he has ever ſince continued; having had ſince not even the ſlighteſt indiſpoſition.

Obſervations on this caſe by Dr. THORNTON.

I. After inebriation we obſerve ſymptoms very ſimilar to thoſe I have above deſcribed. Hence the adage, "It is a pleaſant thing to get drunk, but very unpleaſant the getting ſober again."

II. As the going out into the open air frequently gives relief under ſuch circumſtances, was not the vital air indicated in Mr. Monier's caſe? The event ſeems to prove the propriety of the trial.

III. Then was no pulſation of the temporal arteries, or ſigns of plethora; where theſe appear, ſhould we not caution againſt the application of this remedy?

CASE XXVIII.

Fever.

DEAR SIR,

IT ſeems reſerved for the honour of the preſent enlightened age, to diſcover a ſcientific and ſucceſsful method of treating putrid fever. The contagion has been repreſented as a ſtimulus exhauſting the irritability of the ſyſtem, which depends upon the oxygene in the blood; and a method of cure hypothetically deduced was to ſupply this as faſt as it was conſumed by the exceſſive and morbid ſtimulus. You juſtly reprobate the common practice of drenching patients labouring under typhus, with wine and opiates, until they are not unfrequently ſtimulated to death. "If I have imputed the debility," you ſay, "to its real cauſe, our chief aim ſhould be to reſtore the principle of excitability; and ſtimulants ſhould in the mean time be exhibited with a more ſparing hand." Under this perſuaſion I have conducted my practice, and with what ſucceſs the preſent caſe will diſcloſe. John Lewis, chairman, living at No. 42, Compton-ſtreet, was ſeized with head-ache; rigors, terminating in violent ſweat; great thirſt; a very unpleaſant taſte in his mouth; delirium at night; a ſenſe of burning in the region of the ſtomach; ſpirits exceedingly depreſſed; ſo weak as to feel his legs ſink under him; his countenance is extremely vacant; his anſwers are incoherent; he complains of incipient deafneſs; being deſired to put out his tongue, it appeared coated, and very brown; and there was a crackling noiſe in reſpiration; the pulſe is feeble, tenſe, and very quick.

In order to diminiſh the excitement, and alſo with the view to diſlodge the morbid ſtimulus, I directed an emetic, to be ſucceeded by a cathartic. The former was repeated twice; the latter every night. To impart oxygene to the blood, which was conſuming by the exceſs of morbid ſtimulus, I made him inhale each day ten quarts of vital air to thirty of atmoſpheric; and beſides oxyd emetics and aperients, I gave him nitre; adding a little bark and myrrh to keep up his ſtrength. From my journal it appears, that he progreſſively grew better, and in a fortnight was reſtored, all except his deafneſs; when, by my advice, he went into the country. In another caſe I combined the acetum nitrorum with the happieſt effect.

I am, &c.

R. J. THORNTON.

Observations on this case by Dr. THORNTON.

I. Has not typhus, or putrid fever, commonly two ſtages, in which the blood exhibits oppoſite characters.

II. Does not the ſimilar appearance of the blood in the ſecondary ſtage, as in ſea-ſcurvy, indicate the ſame deficiency of vital air in the blood?

III. Does not the contagion paſs by the ſaliva into the ſtomach and bowels, and there produce its firſt action?

1. Upon diſſection Dr. Crawford diſcovered, that the inteſtinal canal was coated with a thick mucus, often obſtructing the gall duct.

2. Diarrhœa has prevented the acceſs of thi fever; and in the forming ſtage, an emetic or two, with cathartics, has, from concurring teſtimony, ſeldom failed to cut it ſhort.

3. When reſident two years in Guy's Hoſpital, beſides my attendance with the claſs in the morning, being every day two hours after dinner in the hoſpital, I ſtood a peculiar hazard of taking this infectious fever; and I am inclined to attribute my eſcape to my not ſwallowing the ſaliva at thoſe times.

CASE XXVIII.

Ague.

September 10. SAMUEL SMITH, recommended to my attention by Mr. Adams, optician, Fleet-ſtreet, has had an ague above a twelvemonth, caught in working for Lady Dunlop, Hadley-Hall, Eſſex. At firſt it came on him every third day for a month; the next month every other day; and then three times a day for a ſhort time; after which it ſettled in a third day ague. Pounds of bark, bark and ſteel, and a variety of noſtrums, had been tried to no purpoſe. His ſkin was yellow, his appetite gone, he had great debility, uſed frequently to faint away, and was, on his well days, nearly incapacitated from work. Having given him the vital air, eight quarts to thirty of atmoſpheric for two days, he had a ſlight attack on the third. The air was continued, and the next attack was ſtill ſlighter, complexion cleared, appetite improved; and the recurrence of the paroxyſm was prevented. Having perſiſted in the air nearly a month, he was perfectly cured.

R. J. THORNTON.

* * *

CASE XXIX.

Eruption on the Arms.

ELIZABETH FRANKLIN, aged 19, naturally of a very ſtrong conſtitution; with that want of prudence ſo frequently obſerved with thoſe who truſt too much to this circumſtance, after a hard day's labour, being very dry and hot, drank a large quantity of cold water; which immediately produced ſo violent an head-ache, that ſhe was obliged to go to bed. The next day there appeared an effloreſcence on the ſkin, which ſoon ended in a ſcurfy eruption on the arms. It had progreſſively encreaſed; it is now five years; and at length incapacitated her from ſervice, and ſhe became a burthen on her family. She had been under Mr. Dundas's care at Richmond eleven months, but without benefit; having before tried a variety of remedies. Obſerving the great amendment of her neighbour, Richard Major, whoſe caſe I have before related, ſhe was enduced to apply to me. I ordered her a lotion of nitre and vinegar, which Mr. Patterſon, conducted by your obſervations upon ſea-ſcurvy, found to be a ſpecific in that diſeaſe. I gave her vital air to inhale, as a purifier of the blood, in the proportion of ſix quarts to thirty of atmoſpheric; and I diffuſed a greater energy of circulation in the capillary veſſels by means of myrrh, bark, and ſteel, having firſt cleared the prima viæ. The effect of the acetum nitrorum, or ſolution of vinegar in the nitrous acid, was the encreaſing the eruption, occaſioning acute pain, and rendering the parts very florid. It was however perſiſted in, and, after a fortnight, the benefit from this application became very conſpicuous. The vital air, at the time of inhalation, always diffuſed a glow, encreaſed the number of the pulſe, and produced perſpiration. The other remedies tended to keep up this effect; and, after a month, the arms, which before bled upon the leaſt preſſure, were in a fit ſtate to bear the fleſh bruſh, which has been ordered; and the ſurface, after ſix weeks, only ſhews the great extent and malignity of the former afflicting diſorder; and the young woman is reſtored as an uſeful member to the community, being now fit for waſhing, and other ſervices.

R. J. THORNTON.

CASE XXX.

Caſe of Eruption.

Mrs. WILKINSON, who lives in Dartmouth-ſtreet, Weſtminſter, had for fifteen years a *ſcorbutic humour* in the legs, corroding into ſores the muſcular parts, which *ſcurfed*, and occaſioned frequent and violent pain, and an almoſt total incapacity for exerciſe. The muſcles of the calf were hard, and of the colour of mahogany. A great variety of remedies had been tried, as water-dock, elm bark, ſulphur, &c. and this lady, by the advice of Dr. Haighton, phyſician of the Eaſtern Diſpenſary, had taken for the laſt four months bark and lime water. As Dr. Haighton thought her diſeaſe depended wholly upon the conſtitution, and there was no need of any local application different from what Mrs. Wilkinſon was in the daily habit of applying, I was happy to employ upon this occaſion the vital air. This lady, after a week, felt violent itching and pain in the legs; the colour of the parts was viſibly improved; and the ulcers exhibited marks of active inflammation. In a few days after this, the wounds, which were ten in number, inſtead of a thin acrid diſcharge, threw out pus, and the edges in many were diminiſhed. The hardened muſcles not long after became ſoft. The other beneficial effects of the vital air, as far as regards appetite, ſpirits, warmth, ſleep, &c. were the ſame as thoſe which are ſo energetically deſcribed by the Rev. Mr. Atwood, in his invaluable Journal. In ſix weeks only Mrs. Wilkinſon could uſe the fleſh bruſh to both legs; and the laſt account I have of this lady is, that ſhe was able to walk from Ramſgate to Margate, five miles, without a ſenſe of pain in the legs, or even fatigue. I ſhall hope to ſend, at ſome future time, the ſequel of this intereſting caſe; and ſhall beg leave now to obſerve, that the leg of Patterſon, which had for two years thirty holes in it, and was healed by the inhalation of a ſuper-oxygenated air, has continued perfectly ſound, it is now above eighteen months; which leads me to the hope, that a permanent benefit will be alſo derived to this lady.

R. J. THORNTON.

CASE

CASE XXXI.

August 23, 1796.
Bennet-street, *St. James.*

DEAR SIR,

JANE FINLAYSON, aged 7, living at No. 4, Lanier-ſtreet, Bloomſbury, had the ſmall pox five years ago; ſince which period ſhe has been afflicted with a dreadful ſcorbutic humour, covering both legs, the ſhoulders, and the arms; which either encruſted, forming ſcales, or ouzed out a thin, ſerous diſcharge, diſcolouring the linen. She would often awake in the night; when, probably from extreme itching, ſhe would tear the humour, converting it to a ſight truly terrific and diſguſting. This ſhe would ſometimes do, even in the day. Her mother firſt applied to the Gerrard-ſtreet Diſpenſary; and ſhe took pills and aperient powders for ſix weeks, under the care of Dr. Jackſon, without benefit. Her mother then took her to Mrs. Spilſbury, and ſhe continued taking her drops for nine months; but this boaſted acid was equally ineffectual. She now went into St. George's Hoſpital, and fell under the care of Mr. Keate; who employed the unguentum hydrargyri nitrati outwardly, with mercurial pills every night, and an aperient powder every third morning; and theſe were perſiſted in for three months; but they produced only a ſlight degree of benefit, and in a few days after ſhe was taken from the Hoſpital, the diſeaſe broke out as bad as ever. Her mother then, from a very prevalent opinion, judged her only hope was from her breathing her native air, and ſhe accordingly took her over to Ireland;

Ireland ; but neither the journey, voyage, or native air, proving of ſervice, ſhe applied to Dr. Frazier, of Dublin, under whoſe care ſhe continued ſix months. He employed tar ointment, and a lotion chiefly conſiſting of a weak lime water : but, as the caſe ſeemed to defy all art, the mother thought fit to return with her child, rather worſe, than mended, ſeven months ago. Mr. Ogle, an apothecary in Great Ruſſel-ſtreet, at this time refuſed to do any thing for her, telling her mother, " he could not be of any ſervice, and it was beſt to leave her diſorder to nature." This was the candid opinion of ſome other gentlemen of the faculty ; except that one recommended tar ointment, and it was reſumed. The diſorder however getting a head, the poor child was for ſix weeks wholly incapacitated from uſing the ſlighteſt exerciſe ; not being able to ſtand upon her legs, the humour had ſpread ſo around the knees. She was therefore brought to me in arms, and ſhe inhaled immediately ſix quarts of vital air mixed with twenty of common air ; and ſuch is the fact, *in two days' time*, ſhe was able to walk here, above a mile and a half ; her ſpirits were elated ; her complexion was cleared ; the wounds had thrown off large ſcales, ſhewing a gloſſy red ſkin underneath ; in a week the progreſs was ſuch, that ſome large patches had already diſappeared ;—in a fortnight the humour on the legs and thighs was in many places hardened, and had ſcurfed off ;—and in three weeks, on the back and arms there remained only the ſigns of previous diſeaſe ;—and it is now twenty days, and the legs, thighs, the back, and arms, ſhew a truly natural and healthy appearance. The girl took all this time three or four doſes of aperients, and *no other medicine*.

From, dear Sir, your's ever,

To. Dr. Beddoes. R. J. THORNTON.

DEAR SIR,

Basinghall-ſtreet,
Sep. 16, 1796.

Mrs. Finlayſon called upon me yeſterday with her little girl, and brought me your letter. My recollection does not enable me, having ſeen the child but once, to contraſt minutely the former appearance of the eruption with the ſubjacent parts that are now exhibited. I am ſatisfied, however, that there is a material alteration for the better. The inflammation, I ſee, has entirely ſubſided; there is no longer any ſerous diſcharge, which, the mother ſays, was at one time very abundant; and, though there is ſtill a roughneſs, the ſuperficial ſcaly incruſtation is ſcarcely now to be perceived. Wiſhing you equal ſucceſs in all parts of your profeſſional purſuits, I remain,

Dear Sir,

Very ſincerely your's,

WM. BABINGTON.

To Dr. Thornton.

A letter from Mr. Ogle has alſo been tranſmitted to the Editor. He ſpeaks of the amendment in this moſt extraordinary caſe in terms nearly the ſame as Dr. Babington's. He imagines the failure of medicine imputable to extreme want of cleanlineſs:—upon which Dr. Thornton remarks, that the oxygene produced its beneficial effects even under this diſadvantage.

CASE XXXII.

Scrophula.

MARY BUCHANAN, aged 8, lives at No. 2, Witcomb-court, Hay-market; from the account of her mother ſhe was weakly from her infancy. She was two years and a half before ſhe walked; her limbs are crooked, underſtanding remarkably acute, under lip prominent, eyes black, hair lank; was troubled with worms, both the teretes and aſcarides; for which ſhe took Evans's powder, which brought away much ſlime, and many worms: but, from theſe powerful evacuations, ſhe was much debilitated, and became ſubject to profuſe perſpirations, and for a long while was conſtantly ailing; when, whether from cold, or what other cauſe, or the nature of ſcrophula, I cannot determine, ſhe was ſeized with deafneſs; and afterwards with ſuch an inflammation of her eyes, that ſhe was blind for above ten days: leeches were applied to the temples with ſome effect; but theſe ſymptoms only ſeemed to retire, to give way to a more formidable diſeaſe, namely an enlargement of a gland of the neck on the left ſide, which, for three months, kept on encreaſing both in ſize and hardneſs; and the child continually leaning on that ſide, the head became immovably ſunk; ſo that the ear, night and day, nearly reſted on the left ſhoulder. The countenance of the child was pale, body coſtive, belly large and hard, breath offenſive, particularly ſo towards morning, feet cold, itching of the noſe, appetite often keen, but there was no ſtarting in her ſleep, grinding of teeth, or any ſigns of worms obſerved in her evacuation. She was placed, and continued under the care of my friend Mr. Hill, a week. He gave her rhubarb and vitriolated kali night and morning. Sorrel poultices were applied to the neck, the vital air was inhaled, and the caſe was going on very well, when Mr. Hill had occaſion to leave town, and it was then referred to me. I followed Mr. Hill's practice, and in addition employed electricity on the tumour, and directed a tonic mixture of bark and ſteel, keeping the body gently open with the powders. The tumour was at this time the ſize of a gooſe's egg, and very hard. Since the application of the ſorrel, it was looking ſomewhat red. In a week there was produced a conſiderable ſoftening, accompanied with violent pains and reſtleſs nights. I ordered an opiate in the evening. In a few days after this, I made a ſcratch, on the moſt depending part, with a lancet; and repeating this three ſucceſſive days, on the fourth there iſſued through this ſmall orifice a bloody ſerum. I now ordered a bread and milk poultice, diſcontinued the opiate, and increaſed the proportion of ſteel. For ſeveral days the bloody ſerous diſcharge continued, when I ordered the ſorrel poultice to be continued. Almoſt inſtantly the purple tumour was rendered florid, the lips of the orifice became of a bright red, violent pain was excited, and, on the next day, matter of ſome conſiſtency was formed. I moderated the action, when too ſtrong, by a bread poultice; and I ſometimes interpoſed the tonic aperient; and, by always keeping up a due action, in a month the tumour has been wholly removed; the child can turn her head in all directions; ſhe has the appearance and manners of health; and, inſtead of being disfigured, there remains (as in the caſe before related) a ſcar not larger than a pea, and not diſcernible but upon the cloſeſt inſpection.

Obſervations on this caſe by Dr. THORNTON.

I. With rhubarb and vitriolated kali, Sir George Fordyce ſays, he has cured hundreds of pot-bellied children; and calls this powder "antirachitis;" and adds, "had I aſpired after a large fortune, concealing the formula, I could have gained immenſely by its ſale."

II. I have indeed ſeen much good produced from conſtantly evacuating by this powder; but, do we ever obſerve effects equal to what has happened in this and in the caſe before related?

III. I ſhould notice, there was a glandular enlargement on the right ſide of the neck, which was diſperſed in a few days by means of a ſolution of nitre. Did this impart oxygene?

IV. Was not the tumour, which was indolent for above three months, brought to maturation chiefly by the ſorrel, electricity, and the inhalation of the air; for this was effected in a fortnight?

V. Did not ſome benefit ariſe from diſcharging the matter by a ſmall opening?

CASE XXXIII.

Caſe of Leproſy.

AMARO FERNANDEZ, aged 26, has been afflicted with leproſy above ſeven years. He is a native of the Canary Iſlands, where we find that diſeaſe prevalent, chiefly among the common people, whoſe food conſiſts almoſt entirely in ſalt fiſh, ill cured, and eaten in a ſtate of putrid fermentation; and this diſeaſe reſembles elephantaſis, differing perhaps from it only in the extent and urgency of the ſymptoms. It is generally deemed incurable; and terminates in rendering the unfortunate ſufferer a miſerable object; depriving him, by its corroſive nature, of noſe, ears, palate, and eating away alſo other parts of the body. It increaſes by degrees, and ſometimes gives a glimmering of hope; but the expectation always proves deluſive. I will attempt to trace the progreſs of ſymptoms; and ſhall therefore commence by obſerving, that in the year 1789, an eruption broke out on his face, arms, thighs, and legs, which appeared like purple petechiæ, and frequently terminated in offenſive ſores, diſcharging an ichorous ſerum. Mercury and other medicines were employed, but without effect; rather perhaps increaſing the diſorder. In the year 1792 theſe ſymptoms having increaſed, Don Fernandez was recommended to try the Bath waters. In the letter which Dr. Scott wrote to the phyſician of the General Hoſpital at Bath, he obſerves, that he had tried bark, elixir of vitriol, hemlock, and that mercury had been rubbed in for three weeks, but without producing any effect on the mouth. He tried there the warm bath;

and Dr. —— continued the mercury for two months, without its producing the ſmalleſt effect; and at length Dr. ——, declaring he "had uſed mercury enough to ſalivate a horſe," adviſed him to return to London; when he became the patient of Dr. Donavan. It would be tedious to mention all the Doctors under whoſe care he has been, as Drs. Miers, Ralph, Babbington, &c. &c. and many of different countries; and it is impoſſible to record their ſeveral modes of treatment. We ſhall therefore haſten to the year 1795, and mention the ſtate in which he then was. The ſores appear, in 1794, to have healed up, by the application of tar ointment; but the muſcles at this time were in a very hardened ſtate, and aſſumed a very black appearance in both extremities. Under the ſkin there were many hard knots, and in ſimilar points in the correſponding extremities; and theſe frequently broke into fœtid and deep ſores; whilſt others diſperſed without ſuppuration; and others again remained ſtationary. In the year 1795, the noſe ſeems to have been firſt affected, and the ears, which appeared as if froſt bitten, and mortifying off. At this time he was a patient of Dr. Sanderman's, and able to uſe exerciſe, notwithſtanding the rigidity of the muſcles. The diſorder went on increaſing, and he left Dr. Sanderman; and, in the year 1796, unfortunately fell into the hands of an Italian phyſician, who * * * * * * * * * * * * * * * * * confined him to his bed for ſix months; ordered a large fire in the room, and no ventilation, and this in the heat of laſt ſummer; giving him, at the ſame time, his grand infallible ſpecific for every diſeaſe, which he terms the *Phlogiſton of the Firſt Power*. He was at length ſo debilitated, that he was unable to ſit upright in his bed. If he attempted to ſtand, his legs failed under him; and he had loſt his appetite entirely, and hardly had power to ſpeak.

Seeing him in this deplorable ſtate, I mentioned to our Ambaſſador, my wiſh of his trying the vital air, and his Excellency obligingly complied with my deſire. Don Fernandez was, in conſequence, removed from his bed to an airy ſituation in Chelſea; tonic medicines were enjoined; and, when he was in a condition to be removed, which was in a week, he daily inhaled the vital air. After his reſidence at Chelſea but three weeks, under this treatment, he was ſo invigorated, as to be able to walk to and from Bennet-ſtreet, St. James's. In ſix weeks the muſcles were evidently ſoftened; there was a leſs ſcaly eruption on the ſkin; and, at the end of two months, the unſound and ſound parts of the noſe and ears appeared united; and he is now ſo ſtrong as to be able to walk from Chelſea to the Exchange, and back, without feeling the ſmalleſt fatigue; and his appetite and ſleep are the ſame as if he had never been ill; and he is evidently much increaſed in bulk. The change produced is ſo ſtriking, and the trials this patient had made are ſo numerous, and conducted by ſo many able phyſicians, that I cannot but contemplate this, as adding conſiderably to the reputation already ſo juſtly acquired by the pneumatic practice.

I am, dear Sir, &c.

CHARLES DE GIMBERNAT.

London, *Oct.* 30, 1796.

To Dr. Beddoes.

Surgical Caſes and Obſervations.

CASE XXXIV.

DEAR SIR,

MY friend Mr. Danſey has deſired me to ſend you a few particulars, which I collected from a poor fellow, who was cured of a very extenſive ulceration in his neck by the uſe of the wood-ſorrel and meadow-ſweet, applied in the way mentioned in one of your eſſays. I moſt willingly comply with his requeſt, for to you is the poor man indebted for his remedy. It would afford you a real ſatisfaction, to ſee and hear with what enthuſiaſm and gratitude he ſpeaks of his cure and the wood ſorrel. From this caſe, and a ſubſequent trial of it, I believe it to be an application of wonderful efficacy for inveterate ulcerated ſurfaces. That your humanity and benevolence may be fully gratified by a ſucceſsful proſecution of your truly ingenious and indefatigable enquiries, in the event of which almoſt every human being is intereſted, is the hearty prayer of

RICHARD DUNNING.

Dock, Oct. 8, 1796.

WILLIAM GILBERT, of Londrake, in Cornwall, by trade a ſhoe-maker, about two years ſince recovered with difficulty from a fever. Soon after his recovery, he perceived a ſwelling in his neck, juſt under his ear.

After ſeveral months, and a variety of applications, it ſuppurated, and was opened by a judicious ſurgeon in the neighbourhood, who attended him a conſiderable length of time. Under the beſt management, the ſore every day grew worſe, and very ſoon became a miſerably ill-conditioned ulcer. He came to Plymouth, and was ſeen by ſeveral eminent ſurgeons of this place; who conſidered his complaint as ſcrophulous, and ordered an appropriate treatment. No advantages whatever were obtained. The ſore continuing to ſpread, after ſome time extended from the ear to the ſternum; and, from the poor fellow's account of it, muſt now have preſented an aſpect of a moſt horrible appearance, diſcharging profuſely a thin and highly offenſive ichor, and waſting rapidly his conſtitution. At this period of his complaint, he was mentioning his diſtreſsful ſituation to Mr. Danzay (into whoſe hands I had lately put your Eſſays, in which is related a caſe of ſcrophula, cured by the wood ſorrel and meadow ſweet), who told him of this circumſtance, and recommended him to give theſe ſimples a trial. The poor man moſt readily adopted his advice, and uſed them exactly in the way directed in your Treatiſe. By the uſe of theſe ſimple applications, unaſſiſted by any other means whatever, external or internal, at the end of three weeks from their firſt uſe, this very extenſive and foul ulcer was completely healed and cicatrized, and the poor fellow nearly reſtored to his original ſtate of health. He ſpeaks in an emphatic manner of the immenſe pain the application of the wood ſorrel gave him. He ſays, the pain was ſo great, he thought *it had knocked him out of his parts!* He has been well about ſix weeks or two months.

CASE XXXV.

Shefnal, July 21, 1796.

DEAR SIR,

THE mode of application to the ulcer in the neck was as follows. Immediately after the receipt of your letter we applied a poultice, compoſed of ground ſorrel leaves, one part, and marſh mallow roots, three parts, bruiſed together, for two days, frequently renewing it. Conſiderable pain and inflammation was excited at firſt, the ſurface of the ulcer appearing of a black colour, as if ſome active cauſtic had been applied. Afterwards the meadow ſorrel root, bruiſed, and ſoftened with acid butter milk, was continued for a long time, producing a copious diſcharge of excellent pus, the ulcer wearing the *beſt aſpect* I ever ſaw proceeding from ſcrophulous affection; and laſtly, when the diſcharge began to leſſen, and all appearances of ſwelling were totally gone, it was finally healed by a digeſtive ointment, made with gum elemi, reſin flav. ceræ flavæ et ol. ———. I muſt obſerve, that frequently through the progreſs of the cure, fungous edges were inclined to ariſe; but a ſolution of vitriol. canel. in water, anſwered the purpoſe of keeping them under extremely well. If the foregoing account ſhould in any way prove unſatisfactory, be ſo good as point out any further particulars you wiſh to be informed of, and I will endeavour to recite them as accurately as is in my power. In the mean time,

I remain, &c.

SAMUEL BENNETT.

CASE XXXVI.

Inflammation of the Breaſts.

SIR,

Mrs. LEWELLIN, ætat. 25, lives at Camden-town; ſhe was brought to bed of her firſt child laſt July, and, having very ſore nipples, ſhe attempted, after a few days, to wean the babe, and for thirteen weeks kept it from the breaſt; during which time the milk was conſtantly produced in the greateſt abundance, ſo that it run through every thing that was placed to receive it; notwithſtanding nipple glaſſes, and that the milk was frequently drawn off by means of a glaſs pipe, by an obliging neighbour. Inflammation gradually enſued, and it occupied the inferior half of both breaſts, and, extending down to the umbilical region, was terminated by a diſtinct line. The babe was now applied to the breaſt, but would not take to it. The heat and pain became extreme. There were many knotty and hard tumours on both breaſts. Matter ouzed out from the ſurface. The pulſe was 110, full; perſpiration conſtant and profuſe; agony ſo great, that ſhe was deprived of ſleep; and the child not thriving, and continually crying in the night, increaſed the affliction. She had given up all hopes of recovery, or even outliving many days, when ſhe applied to me; and her caſe ſeemed to demand a new practice. Appearing too weak for the lancet, this remedy was precluded. As to evacuations, the ſame reaſon weighed alſo againſt that plan. The ſpeedieſt benefit, however, might ariſe from *diſoxygenation* of the *blood*, and the caſe was urgent. I therefore filled a bell glaſs with atmoſpheric air, and burning two table ſpoonsful of æther in it, I rendered it chiefly azote, and inflammable air. She perſiſted in inhaling this for about five minutes, ſtanding up, until the pulſe was obliterated; the eyes became dim, and no longer repreſented the objects of viſion; the face was deadly pale; and ſwooning coming on, ſhe fell into the arms of a ſervant, and we placed her on a chair, and I opened the window to admit freſh air. In about ten minutes ſhe revived; ſhe fetched ſeveral deep ſighs, and appeared faint, and ſtill very languid. The pulſe was feeble, and only 98; and for the firſt time, ſhe ſaid, for ſome weeks, ſhe felt her breaſts cold and eaſy. I directed her, when ſhe got home, to apply clothes wrung in yeaſt to the inflamed ſurface; and I ordered an electuary three times a day of ſulphur, and ſulphurated kali; and on the ſound part, around the inflammation, I directed half a dozen leeches to be applied; and to divert the current from the inflamed parts, I ordered a large burgundy pitch plaſter to be placed betwixt the ſhoulders, which however acted like a bliſter. On the the third day, when I ſaw my patient, her ſpirits were revived; the vivid red colour was abated; the tumours of the breaſts were ſoftened; and the milk could be drawn off without torture. Mrs. Lewellin inhaled the air as before, but with leſs ſedative effect; when I ordered four freſh leeches (for the others had died immediately after the operation), and the yeaſt and electuary as before. On the fourth day there was no longer occaſion for leeches, or the yeaſt fomentation. The electuary, and a reduced atmoſphere, were, however, continued; and in a week the cure was perfected; and the child was applied to the breaſt, and health and happineſs were reſtored to both.

R. J. THORNTON.

CASE XXXVII.

Birmingham, Aug. 20, 1796.

DEAR SIR,

I TRANSMIT to you the following hints on the effects of factitious airs in caſes of ſurgery, to induce the humane practitioners of that art to extend the application of them. In the management of large ulcers, when the diſcharge is thin and copious, the great deſideratum is to increaſe the abſorption: for, unleſs ſecretion and abſorption maintain a juſt equilibrium, a cicatrix can never be formed. But the moſt ſkilful ſurgeons frequently know not how to accompliſh this end. The whole liſt of general and topical remedies at preſent known, however judiciouſly applied, are always ſlow in their operation, and ſometimes entirely fail in producing the deſired effect.

Carbonic acid air has been lately found, by Dr. Ewart and others, to promote the abſorption of the moſt virulent matter, from the moſt inveterate ulcers, in a manner previouſly unknown. Hydro-carbonate, as far as I recollect, has never been tried as an external application: but I have had repeated proofs of its producing this effect in a powerful and rapid manner, when uſed as a general remedy.

A patient of mine, afflicted with ſcrophulous ſwellings and ulcerations, who had for ſome time inhaled oxygene air, and had been much improved in his ſtate of health by the medicine, deſired me one day to examine his head, as he feared ſome freſh ulcers were about to break out there. Upon examination, I found the ſkin raiſed in ſeveral places, by collections of effuſed lymph ; each tumour containing apparently from half an ounce to an ounce of fluid. In this manner, he informed me, the complaints uſually began ; the lymph gradually accumulating till it produced inflammation of the ſkin, and an ulcer, extremely difficult to heal. The proceſs followed exactly the ſame courſe when he inhaled oxygene. A mixture of oxygene and hydro-carbonate was then tried : the fluid was ſoon completely abſorbed, and the tone of the relaxed ſkin perfectly reſtored. The experiment has been repeated five or ſix times on the ſame and other patients, and has uniformly produced the ſame effect.

In ſome of the caſes, where the conſtitution was more vigorous, hydro-carbonate alone, diluted with atmoſpheric air, was uſed. In others, where the debility was very great, the quantity of oxygene was increaſed, and the hydro-carbonate given in a very ſmall proportion, ſo as to produce only a ſlight degree of vertigo.

From theſe facts may it not be inferred, that many humours might thus be prevented from burſting, and the admiſſion of common air avoided, which always produces painful and morbid effects on a fine cuticular ſurface. That hydro-carbonate promotes abſorption, is further proved by its effects on the expectoration of phthiſical patients. In all caſes the matter is rendered leſs copious and thicker by the uſe of this air, and the difficulty of breathing is at the ſame time much relieved.

In Richard Newbury's caſe, an account of which I underſtand is tranſmitted to you by Dr. Carmichael, the abſorption was ſo rapid, that a quantity of the matter which could not be diſcharged by the natural emunctories, was depoſited on the ſurface of the ſkin, and the cure was ſpeedy and permanent. If it be ſaid, that the ſame effect may be produced by ipecacuanha and other emetics, it may be replied, that the action of the hydro-carbonate is more correct and certain, that the degree of its power can be accurately regulated by the practitioner, and that it produces neither nauſea nor relaxation of ſtomach, by which the patient is deprived of a regular ſupply of nouriſhing food.

It might be eaſy, perhaps, to produce facts to ſhew, that hydro-carbonate is the moſt direct, powerful, and eaſily-managed antiſpaſmodic yet diſcovered; that it produces no coſtiveneſs, like opium, nor any effect whatever, but that for which it is exhibited; and that it will probably be found capable of relieving or removing ſome of the moſt diſtreſſing calamities that are incident to humanity; ſuch as convulſions, locked jaw, hydrophobia, &c. But at preſent I mean only to bring forward hints, that others, who have inclination and opportunities, may put them to the teſt of experiment.

I am reſpectfully your's,

JOHN BARR.

Extracts of Letters from Mr. SANDFORD, *Surgeon, Worceſter.*

I STILL continue to apply the charcoal poultice, with the ſame beneficial effects as before. I have lately applied it with very beneficial effects to a lady, that had been very extenſively ſcalded, about a week before the application. It ſoon produced a ſloughing, and good pus; though the limb was hard, livid, and approaching to mortification. The ſloughing, when it did take place (which was not till many days after the application of the poultice), was ſo extenſive, that a very large and thick poultice was neceſſary to cover it; and when the ſloughs were thrown off, mild eſcharctics were applied; but in ſuch a way, that the poultice (which was now divided in different portions) was applied to the digeſting parts, and the cerete to the other parts, till the whole was healed. By this means the fœtor was corrected, and the healing proceſs forwarded at the ſame time.

I have alſo lately applied the ſorrel poultice to ſcrophulous tumours, with very manifeſt advantage. I have remarked, that ſometimes the ſtimulus, when the bruiſed leaves are applied, is too great, and induces a high degree of inflammation, attended with great pain. I generally apply the leaves ſeparated from the ſtalks, well bruiſed, and added to a ſoft and well-boiled poultice of oatmeal and ſmall beer. The quantity of ſorrel neceſſary to be added to this poultice, can only be learnt from its effects on the parts to which it is applied. I am now applying it to an ill-conditioned ulcer, with inflammation and hardneſs of the ſubâuxillary glands, with evident advantage; and alſo to a ſcrophulous knee, on which are ſeveral ſpungy and ſluggiſh ulcers: both theſe patients are taking the extract of oak bark, with an aromatic (as mentioned in your former publications) and ſal. ſodæ.

I do not recollect whether I mentioned in my laſt, that Mr. Polhill, ſurgeon to the Engliſh Hoſpital at Leghorn, had lately informed me, that he had very frequently applied diluted lemon juice, with the beſt effect, to ſcrophulous ulcers on the legs of ſailors.

In the treatment of *ulcers* in general I have remarked (as no doubt many other ſurgeons have alſo) that their diſpoſition to heal depends (let the means of promoting this purpoſe be what they may), upon the matter ſecreted by them "being firſt thickened by increaſing the abſorption in *them*, and then leſſened, till all the matter "is abſorbed which is brought by the arteries, inſtead "of being depoſited in the ulcers," as Dr. Darwin has ingeniouſly ſuggeſted. See the ſecond volume of his Zoonomia, p. 47. The action of ſorrel and lemon juice, applied to ſcrophulous ulcers, probably effects its purpoſe in a two-fold manner; as, firſt, by ſtimulating the languid inirritable abſorbents, by means of the oxygene contained in theſe ſubſtances; and, ſecondly, promoting the abſorption of the thinner parts of the matter, in the ſame manner that acids, when taken into the mouth, coagulate viſcid phlegm.

REMARKS

REMARKS.

1. CASES XXIX. XXX. and more particularly XXXI. and XXXIII. (atteſted, as they are, by three different obſervers) will not fail to occaſion further trials of oxygene air in obſtinate cutaneous diſeaſes. The principle of the great efficacy aſcribed to it in theſe caſes, I take to be its power of exciting the arterial ſyſtem. There have been tranſmitted to me (without permiſſion to make them public) obſervations, in which the effects of ſtronger action in the minute arteries are very apparent. Such are the amendment or thickening of the matter ſecreted from ill-conditioned ulcers, and the renewal of the ſuſpended diſcharge of iſſues. Had oxygene gas been known centuries ſooner, it might have proved a reſource againſt the moſt loathſome malady that has afflicted mankind; for the contagion of leproſy ſeems to have diminiſhed the power, and deſtroyed the life, of the cutaneous capillaries (*See Henſler vom auſſatze. Hamburg*, 1790.). At preſent, this ſpecies of air deſerves a trial in thoſe kindred diſorders, that occur not infrequently in hot climates, and are ſometimes ſeen in theſe latitudes (*Rapp. des Commiſſ. de la Societé Roy. de Med. ſur la Mal Rouge de Cayenne, ou l'Elephantiaſis. Paris*, 1785.).

Caſe XXVIII. of an obſtinate ague, cured by oxygene air alone, indicates a power that could hardly have been anticipated by ſpeculation. We have lately received confirmation of the efficacy of an expedient, in uſe among the Dutch fiſhermen, for ſtopping an ague fit. It conſiſts in arreſting the circulation in one arm and one leg, at the commencement of the cold ſtage; by which the influence of the brain and the effect of reſpiration are confined to part of the body, and may be ſuppoſed to occaſion greater energy of action in that part. Will the inhalation of oxygene, by heightening the effect of reſpiration, prove equivalent to the Dutch practice? The caſe will not be overlooked by thoſe who have the treatment of agues that do not yield to the *mineral ſolution*, to bark, or the broad-leaved willow, which has appeared to me fully to anſwer the character given of it by Mr. James (See his *Obſervations*. Johnſon, 1792).

II. I have formerly preſſed the uſe of oxygene in the latter ſtage of low fever, and of that very fatal diſeaſe, the confluent ſmall-pox. No direct deciſive trials have come to my knowledge; for Caſe XXVIII. goes only to ſhew, that oxygene air may be adminiſtered with ſafety: and in Mr. Murdock's daughter, in whom it is reported to have produced ſudden change for the better, when ſhe was near the point of death (ſee letters from Dr. Withering, Dr. Ewart, and others, p. 23), we have but a ſolitary inſtance of deciſive power.

Thoſe experiments, however, on the power of the vapour of mineral acids to deſtroy *contagion*, which have been made within the laſt 25 years, and which of late have been proſecuted with the ardour they deſerve, ſeem to furniſh ſtrong evidence of the uſe of oxygene in the debility of bad fevers. This concluſion, I think, diſtinctly reſults from a compariſon of the different methods practiſed within the period aſſigned.

Mr. Morveau, reflecting probably upon the power aſcribed to acids over contagion, conceived the idea of filling an infected atmoſphere with marine acid vapours. Theſe he ſucceſsfully applied to the ſweetening of places filled with putrid exhalations (*Journ. de Phyſique*, I. 436.). And, (*Ibid.* III. 73) we have an inſtance of the purification of a place, infected with jail fever. The facts were alſo recorded in the *Mem. de Dijon.* The commiſſaries of the Paris Academy recommended an annual purification of priſons in this method (*Mem. Acad. de Paris*, 1780.). The rooms were evacuated; and, oil of vitriol being added to common ſalt, they were kept ſhut for ſome time. Mr. Morveau ſuppoſed the acid to unite with the volatile alkali which ſuſpended the infectious miaſmata. I rather imagine that *febrile* contagion, at leaſt, is much allied to volatile alkali in its compoſition, and that it is neutralized by acids.

The French never afterwards loſt ſight of this application. In October, 1787, I remember accompanying M. et Mad. Lavoiſier, M. Morveau, M. Chauſſier, Dr. Fourcroy, and other philoſophical perſons, to the Dijon Hoſpital. After mentioning the ſingularity of the foundation, and pointing out the elegance of the inſcription, they enquired whether acid vapours, in M. Morveau's method, were not in familiar uſe in England. They ſpoke as if perfectly convinced of their efficacy. In 1791 Dr. Fourcroy thus prefaced his propoſal for employing oxygenated marine acid, in void infected rooms: "On " ſait dejà que la vapeur de l'acide muriatique - - - - " - - - - - - - a rempli ce but, et qu'elle a parfaitement " reuſſi à M. Morveau. *(La Med Eclaireé*, II. 89.) In the beginning of 1794, (as is ſeen from the quotation, Appendix, No. VI.) it had been aſcertained by the members of the *Conſeil de Santé*, that a ſmaller quantity of M. Morveau's mixture of common ſalt, water, and ſulfuric acid, moved about to every part of an occupied ſick or foul room, would perfectly ſweeten and *diſinfect* it; and that this proceſs occcaſions no diſagreeable or incommodious ſenſation. It has been lately ſaid by an Engliſh writer, that the French do not " appear to have " ſuſpected, that the power of deſtroying contagion is " a quality inherent in all mineral, and probably, to a " certain degree, in all acids, under certain circum" ſtances." *(Dr. J. C. Smyth, on the Jail Diſtemper*, p. 203). In the *Inſtruction*, however, of which the Author is here ſpeaking, this power ſeems to be expreſsly aſcribed to all acid fumes:—*ce n'eſt point que le vinaigre, mis en expanſion dans une bouteille à large orifice, ne puiſſe, comme* TOUS LES ACIDES *dans l'etat de gaz, former des combinaiſons avec les miaſmes ammoniacaux putrides, les detruire et rendre à l'air, dans lequel ils etoient comme diſſous, ſa pureté et ſon elaſticité.* (Journ. de Phyſique. Ventoſe, an 2, p. 167.) If the vapour of nitric acid has really not been uſed in France, might this not have happened, becauſe ſo much gunpowder was wanted for deſtruction, that no nitre could be ſpared for preſervation?

In 1780, Dr. J. C. Smyth appears to have ſucceeded in deſtroying a moſt peſtilential contagion at Wincheſter, principally by acid fumes. He had the floors and walls of the priſon and hoſpital wards, alſo the hammock poſts, as high as the cieling, freely watered with diluted marine acid. Gallipots, containing fuming nitrous acid, were kept day and night in the inhabited wards; and the infected utenſils and clothes were waſhed with marine acid.* This acid probably acted with ſtill greater efficacy than Dr. Smyth conceived; and, if there be an analogy between certain ſpecies of contagious effluvia and volatile alkali, the ſmall quantity in which marine acid may neutraliſe thoſe effluvia, will hardly be imagined, but by thoſe who have obſerved the action of marine acid air upon alkaline air, and the manner in which bright iron is affected by a ſmall quantity of marine acid, ſet at liberty in a ſpacious apartment.

Although theſe methods ſucceeded ſo happily in preventing infection, there is no evidence of their having contributed to the recovery of the ſick; till, in conſequence of the meritorious perſeverance of Dr. J. C.

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* Dr. S. having mentioned the fuming yellow nitrous acid, and the nitrous acid, as detached from nitre by vitriolic acid, adds—"In one "or other of thoſe forms I have uſed it, both in hoſpitals and in pri- "vate practice, for 16 or 17 years paſt" (Jail Diſt. p. 193.). It is ſingular, if he had uſed the latter method 16 or 17 years before 1795, that he ſhould have deflagrated nitre in 1780, by a hot iron, with a view to extricate vapour of nitrous acid. This Dr. S. confeſſes was a miſtaken view; but he thinks the deflagrated nitre "furniſhed a quan- "tity of oxygene, or air much purer than the common air of the atmoſ- "phere." (p. 174.)! and thus purified the wards!

Smyth, a careful trial of the ſumes of nitric acid, copiouſly raiſed by ſulfuric acid, took place on board the Union hoſpital ſhip (*Dr. Smyth's Account of the Exp.* Johnſon, 1796.). The managers of the experiment were ſtruck, not merely with the deſtruction of the offenſive ſmell ariſing from the crowded ſick, but with the change in the courſe of the diſeaſe. Mr. Menzies ſays, "As none of the ſick, who have been brought to the "Hoſpital ſince my arrival, have died, it would ſeem "that the fumigation has not only leſſened the danger of "infection, but alſo *the malignity of the diſeaſe.*" p. 19. Mr. Baſſan, the ſurgeon of the ſhip, aſſerts, that the "ſymptoms are much meliorated. I believe," he adds, "that the fumigation has been of *great ſervice to the* "*ſick.*" (p. 24.) For this operation, it appears from the report, that neither of theſe gentlemen were looking; and Dr. Smyth ſays, "that the vapour of the nitrous "acid ſhould be found to deſtroy an offenſive ſmell, the "effect of animal exhalations, I was not ſurpriſed at, "having myſelf had repeated experience of the fact; "but, that it would alſo render the air purer, aud more "proper for reſpiration, I was by no means certain, "until I found the repeated obſervations of theſe gen-"tlemen confirmed by the evidence of Mr. Keir." (p. 51.)

No oxygene gas is extricated during the diſtillation of marine acid; nor does marine acid gas ſhew any of the eminent effects of oxygene. In the diſtillation of nitric acid, oxygen gas is extricated; and nitric acid gas ſhews eminently the effects of oxygen. The fumigations, therefore, in which oxygene gas and analogous vapours were extricated with benefit to perſons ill of a low fever, countenance very ſtrongly the propoſal for exhibiting oxygene gas for the cure of febrile (not inflammatory) diſorders.

It would be curious to know the effect of theſe oxygenating fumigations on ſcorbutic patients : but, in conſideration of the ſeemingly fatal effects of expoſure to a free atmoſphere, I ſhould not feel juſtified in venturing the trial. If the acid fumigations become general in the navy, inevitable accidents will teach us, whether oxygene, from its ſtimulating effect on the arteries, is pernicious or beneficial in ſcurvy. We ſhould not now have been ignorant, had they been in uſe laſt year, when the whole Channel fleet had been nearly diſabled by the ſcurvy ; for while in port, it was ſupplied (I ſuppoſe on account of the dearneſs of fat cattle) with ſalt meat.

III. Mr. Patterſon's experiments with nitre in vinegar have not yet, I apprehend, been ſufficiently authenticated to afford, to perſons acquainted with thoſe of Dr. Trotter, much hope that the ſcurvy can be cured without freſh vegetables. The facts being granted, it has been aſked, upon what principle can nitrous vinegar oxygenate the ſyſtem, when nitre alone does not ? Can it be, that the nitric acid is rendered more eaſy of decompoſition, by the attraction of the acetous acid for the vegetable alkali ? We know little of the action of ſalts, compounded of two acids and an alkali, even on dead matter, except what Mr. Keir has diſcovered (*On Metallic Solutions.* Phil. Tranſ.).

IV. The ſtudy of a method to render oxygene more efficacious, and to produce it in greater purity, deſerves the attention of thoſe who think it likely to become an uſeful remedy. I have met with caſes in which it ſeemed to have no action on the ſluggiſh arteries. A lady, whoſe extremities were habitually icy cold, began with two, and came to take a hundred, quarts a day, ſometimes pure, and ſometimes diluted. I never could perceive any change of the pulſe during the inhalation, even of ſixty quarts. At length, however, the torpor of the extremities was overcome by it. Dr. Clark, of Newcaſtle, had an enfeebled patient, who received benefit from oxygene ; and, as Dr. C. thinks, would have received much more, if the power of the oxygene could have been enhanced. I am now about to try two methods of effecting this ; and doubt not, but by the Inſtitution for aſcertaining the virtues of airs, a mode of increaſing its power twenty fold will be diſcovered.

I never was afraid, that elaſtic fluids would fail of a trial ; but I am now ſeriouſly apprehenſive that they will be abuſed. In London, if I am not miſinformed, in conſequence of benefit to ſome diſtinguiſhed perſons, beſides thoſe whom I have been permitted to name, a rage for reſpiring them ſeems to be kindling. In ſome caſes no good, in others much harm, will enſue. And we may ſee *that* realiſed, which prudent men have augured of other good medicines undiſtinguiſhingly adminiſtered : *variis hiſce auſis metuendum eſt ne in neglectum vel deſpectum recidant.*

END OF PART IV.

PART V.

PART V.

SUPPLEMENT
TO THE
DESCRIPTION
OF A
PNEUMATIC APPARATUS,
FOR PREPARING
FACTITIOUS AIRS;
CONTAINING A
Deſcription of a Simplified Apparatus,
AND OF A
PORTABLE APPARATUS.

By JAMES WATT, Engineer,

DESCRIPTION

OF A

Simplified Pneumatic Apparatus.

AUGUST, 1796.

THE Pneumatic Apparatus, deſcribed in Dr. Beddoes's Conſiderations on the Medicinal Uſe of Factitious Airs (Part II. Ed. 3rd.) and in a ſeparate Deſcription of that apparatus, is found to anſwer its intention, ſo as to leave little to deſire upon the head of utility or convenience. What is now offered relates merely to a ſimplification which may effect a reduction of price; at the ſame time that in the hands of a ſenſible practitioner, it will not eſſentially abridge its utility in the preparation of oxygene air, and of the inflammable airs from charcoal and from iron, though it may not be ſo proper for the preparation of the zincic inflammable air, or the fixed air from chalk.

If it were natural for mankind to think firſt upon the ſimpleſt methods of performing any proceſs or conſtructing any machine, ſome apology might be neceſſary for not bringing forward this ſimplification ſooner ; but the contrary ſeems to be the caſe ;—at leaſt the method now propoſed did not occur to the writer until very lately, and ſome doubts being entertained, whether or not it might anſwer as well as it does, it was thought proper to refer that matter to the teſt of experiment, which has occaſioned ſome delay.

The ſimplification conſiſts in laying aſide the hydraulic bellows and refrigeratory, and conveying the air directly from the fire-tube, wherein it is generated, to the airholder. This was always thought a deſirable object ; but it was conſidered, that if the air were conveyed from the fire tube into the airholder by the pipe U, which receives it from the bellows, it would require a very nice regulation of the exit of the water at the lower pipe Z, to prevent the water in the airholder from weighing with its whole column, thereby making a degree of exhauſtion in the fire-tube and conducting-pipe, and drawing in the atmoſpheric air at every ill-cloſed joint ; the advantage of waſhing the airs, and condenſing the ſteam in the refrigeratory, would be loſt, and there would be opportunity of examining the quality of the air from time to time. A very ſimple idea has in great meaſure obviated theſe inconveniencies ; it conſiſts in making the lower pipe (*z*) of the airholder inclined at an angle of 45 degrees, and of ſuch length that the lower edge of its mouth ſhall be a little higher than the upper edge of the inner opening, by which it communicates with the airholder (ſee *z*, plate 4th, fig. 2.). The airholder being filled with water, and the pipes *k*, *t*, and U very well corked, ſo as to be air-tight, it is evident that no water can run out, though the ſloping pipe *z* be opened, becauſe the water cannot iſſue without the entrance of the air, and the latter is prevented from entering at *z*, by the upper edge of the inner opening being lower than the ſurface of the external water in that pipe. It is exactly in the ſame caſe as the water in the common reſervoir glaſs for birds, into which the air only enters in conſequence of the bird exhauſting the water in the little ciſtern.

Now, in order to receive the air from the fire-tube, as it is produced, all that is neceſſary is, inſtead of fixing the conducting-pipe F horizontally, to make it ſomewhat bent, ſo that its lower end may be inclined at an angle of 45 degrees to the horizon, or thereabouts, and to fit to that end the tin tube (*u*), the end of which being introduced into the ſloping pipe *z*, ſo that its opening, which is in its upper ſide, ſhall be fully within the cavity of the airholder; the air as it enters will aſcend to the upper part of the airholder, and will diſplace its own bulk of water, which will iſſue through the pipe *z*, by the ſide of the pipe (*u*), which occupies only a ſmall part of the opening. The ſituation of the reſpective parts of the apparatus, applied in this manner, is ſhewn in plate 4th, fig. 1, more intelligibly than it can be expreſſed in words.

TO PREPARE OXYGENE AIR.— The manganeſe being pounded, and put into the fire-tube, the joints being made good, as pointed out in the former part of theſe directions, and the conducting pipe F fixed as has juſt been explained, and ſupported at a proper height, the pipe *z* being well ſtopped with a cork, and the other pipes *k t* and U both open, fill the airholder quite full of water, and cork the upper pipes very ſecurely, anointing the corks with ſome china clay luting, place the airholder upon its ſtool in the ſhallow tub, which is to receive the water ; bring the pipe *z* cloſe to the ſmall pipe (*u*), and uncork *z* ; then move the airholder towards the ſmall pipe, and inſert the end of the latter into *z*, as has been directed ; raiſe the end of the ſmall pipe as high as the opening in the airholder within *z* will permit, and ſupport it there by a ſmall wooden wedge put under it in the mouth of *z*, apply your fire, and the air as it is produced will enter the airholder, and the water thus diſplaced will iſſue at *z*, and be received in the tub. When the airholder is emptied of water, down to the level of the under edge of the mouth of *z*, air will begin to iſſue at *z*. The airholder muſt now be removed, and, if more air is wanted, another airholder put in its place.

TO WASH THE AIR. — Slack ſome good quicklime, and, when fallen to dry powder, ſift it through a common hair ſieve, preſerve it in a pot cloſe ſtopped for uſe. If the powder feels damp, dry it over the fire. Provide a tin tube, open at both ends, wired at one end and plain at the other end ; its dimenſions may be three quarters of an inch in diameter, and four inches long. Dip this tube with its cutting end downwards into the pot filled with the ſlacked lime, and if the lime is deep enough, it will be filled with it, otherwiſe it muſt be dipt again in a freſh place until it be filled with lime. Inſert the end of this pipe into *z*, and puſh the lime into the airholder by means of a piece of wood. If the air is tolerably pure, two fulls of this pipe will be ſufficient for half a cubic foot, and four for a cubic foot airholder. The lime may alſo conveniently be put into the airholder, by thoroughly mixing the deſired quantity with half a pint, or a pint of water, and pouring it in through a funnel by the pipe U, at the top of the airholder, the pipe Z being previouſly corked. When you have put in the lime, cork *z*, and ſhake the airholder very briſkly in every direction for about three minutes; then removing the ſtool, place the airholder in the water in the tub, ſo that the water may cover the opening of *z*; pull out the cork, and the water will enter and ſupply the place of the fixt air abſorbed; repeat the ſhaking, until, upon opening the pipe *z* under water, none enters. Replace the airholder upon its ſtool, inſert the end of *u* into *z*, and, by the introduction of more oxygene, diſplace the water which had been admitted, cork the pipe *z*, and ſet the airholder in a cool place till it depoſits the ſuſpended mangaueſe, which it will do in leſs than twelve hours, before which time has elapſed none of the air ſhould be uſed.

If you want to examine the quality of the air before you receive any into the airholder, place the end of *u* in a baſon containing water, in ſufficient quantity to cover the end of the pipe, and to ſtand an inch or two higher; then having filled a common bottle or vial with water, place your thumb upon its mouth, and invert it with its mouth under the ſurface of the water in the baſon, directly over the opening of the pipe *u*; the air as it iſſues will aſcend into the bottle, and may be examined by the common teſts; or, by holding a lighted taper over the opening of the pipe, you may ſee by the brightneſs of the flame, whether or not the air produced is much dephlogiſticated.

In general, the air from Exeter manganeſe has little other admixture than fixed air in ſmall quantity, probably moſtly produced by the action of the oxygene on the carbone of the iron tube. Sometimes pieces of a brown toad ſtone, with whitiſh ſpots, are intermixed with manganeſe: theſe pieces will be eaſily diſtinguiſhed in breaking the manganeſe, and ſhould be picked out, as they yield fixed air inſtead of oxygene. When you mean only to try the air by its effects upon flame, that may very conveniently be done, by placing the airholder in ſuch a manner, that the opening of the conducting pipe, inſtead of being fully within the airholder, may lie in the ſloping pipe, though under water (or by pulling out the ſmall peg in the ſide of F.) When your trials prove ſatisfactory, the airholder is to be brought ſo much nearer the furnace, that the opening of the pipe (*u*) may be quite within it.

CAUTION. In operating upon ſmall quantities of manganeſe, care ſhould be taken to place them in the middle of the fire-tube: near the ends it may not receive the due heat.

HYDRO-CARBONATE. In preparing this air, the fire tube ſhould be red-hot before any water is admitted by the water pipe; and before the airholder is applied, water ſhould be admitted pretty freely to diſlodge any other air which the charcoal may have imbibed. After about five minutes rapid production of air (which ſhould be conveyed up the chimney by a pipe placed over the opening of *u*), the entry of water ſhould be ſomewhat reſtrained, and the airholder ſet in its place, as has been directed for oxygene.

The proceſs goes on with a proper ſpeed when the large airholder, containing a cubic foot (about 24 ale quarts) is produced in twenty minutes, or half an hour, while the fire-tube is fully red-hot. If water is admitted too freely, ſteam will be produced, and would paſs into the airholder and heat the water there. Beſides, a ſuperfluity of water cauſes the production of a greater quantity of fixed air, than takes place when the operation goes on ſlowly. In order to free the hydro-carbonate air perfectly from fixed air, it may be waſhed with lime, as has been directed; but may be uſed as ſoon as the waſhing is completed, the ſuſpended charcoal ſeeming rather advantageous than otherwiſe.

This ſpecies of air is found to be more or leſs powerful in producing ſenſible effects upon the human body, according to circumſtances in its preparation, which are yet unknown. It merits to be verified by experiments, whether the degree of the heat of the charcoal does not affect it; and in the ſame way it ought to be determined, whether the charcoal of different vegetable ſubſtances do not produce airs of ſomewhat different qualities as to their medicinal effects.

FERRIC INFLAMMABLE AIR, may be prepared as directed for the hydro-carbonate.

It has been obſerved, that this method is not recommended for the preparation of the zincic inflammable air, nor for the fixed air from chalk; in both of theſe a ſuperfluity of water ſeems neceſſary, and there being no refrigeratory to condenſe the ſteam, it would heat the water in the airholder.

In many experiments, the hydraulic bellows and refrigeratory afford a great convenience, the former in readily aſcertaining the quantity of air produced, and the latter, by condenſing the ſteam; and, when quick lime is mixt in the water, by abſorbing fixt air and other acid vapours. If the manganeſe is of a good quality, and no inflammable matter is mixt with it, the mixture of lime with the water of the refrigeratory, and the uſe of the agitator, will render it ſufficiently pure to be breathed, eſpecially if it is adminiſtered conſiderably diluted ; but, when given with ſmall admixtures of common air, the utmoſt purity is neceſſary. As in preparing oxygene air, the exact quantity of materials neceſſary cannot previouſly be aſcertained ; if more than fills an airholder be produced, it may conveniently be retained in the bellows till wanted. If azotic air ſhould prove uſeful, as it is very probable may be the caſe, its preparation from burning charcoal requires the uſe of the hydraulic bellows. Theſe bellows alſo make a good machine to inhale mixtures of air from, in place of the ſilk bags.

Every perſon wanting an apparatus will ſee from what has been ſaid, the advantages and diſadvantages of this ſimplified apparatus, and be enabled to judge for himſelf. To thoſe who principally wiſh to prepare oxygene and hydro-carbonate airs, there ſeems no doubt that it will ſave money in the firſt coſt, and ſome trouble each time the apparatus is uſed; but, to thoſe who wiſh to make experiments upon various airs, the hydraulic bellows and refrigeratory ſeem neceſſary.

LIGHTING THE FIRE. Some gentlemen complain that the fire in the furnace is difficult to kindle, and that ſome time elapſes before it attains the proper heat. This may be remedied by covering the furnace with a conical tunnel of a foot high, having an opening at the vortex of four or five inches diameter ; but if this tunnel be not removed as ſoon as the fire tube becomes red-hot, which may be neglected, there is a riſk of melting or ſpoiling the fire-tube. The readieſt and ſafeſt way ſeems to be, to light the fire in the furnace, by means of ſome chips and a ſhovel full of live coals, with the proper quantity of coaks; and to let the lining of the furnace become red-hot before the fire tube is put in; which may eaſily be done by taking out ſome of the coaks, and removing the reſt to the ſides of the furnace, ſo as to make a clear paſſage for the fire-tube, which, having one of its end pieces previouſly luted into it, muſt have the joint of the other made good before it has time to become too hot. The coaks which have been taken out, on being replaced, will readily light again, and much time will be ſaved in heating the tube.

AIRHOLDERS. This ſimplified apparatus cannot advantageouſly be uſed with fewer than two airholders of a cubic foot each, or more of ſmaller ſizes; and the large furnace and apparatus ought to have at leaſt three airholders of the large ſize. The large airholders and their contents of water weighing near ſeventy pounds, it will be found convenient to fill them ſtanding in their place upon the ſtool in the tub; or, which may in ſeveral reſpects be more convenient, though more expenſive, to uſe a double number of three-gallon airholders in place of them. Airholders of ſix quarts are convenient for ſending out doſes of air to patients.

MOUTH PIECES. Many patients with difficulty acquire the habit of inhaling air from a bag, and returning the air from their lungs through the noſe. Some make ſuch deep inſpirations and ſtrong exertions, as to fatigue their lungs and the reſpiratory muſcles, whereby ſpaſmodic pains in the breaſt have ariſen, which in ſome caſes have been imputed to the factitious air; but the ſame pains ariſe in ſuch perſons when only the common air of the atmoſphere is inſpired in the ſame manner, and even when no bag is employed: a mouth-piece has therefore been conſtructed with two valves of ſilk, upon the ſame principle as that communicated to Dr. Beddoes by Mr. W. Capper, and publiſhed in the ſecond edition of the Conſiderations. It is, however, very much ſmaller, gives leſs reſiſtance to the air, and is conſtructed ſo as to be applied to the ſmall end of the faucet of the oiled ſilk bags. With this mouth-piece a perſon may breathe perfectly in their natural manner, without ſtraining the muſcles of the breaſt, and without any other ſubjection than the holding a ſmall pipe in their mouth, the end of which is, for the greater eaſe, made in an oval form.

Queries, however, ariſe, whether thoſe deep inſpirations are not of ſervice, by opening the ſmall veſticles of the lungs, and giving them greater exerciſe? Alſo, whether the hydro-carbonate, at leaſt, may not produce good effects, by acting upon the nerves of the noſe during the exſpiration of the air? Without attempting to ſolve theſe doubts, it is certain that the uſe of the mouth-piece does not preclude the taking deep inſpirations; nor, when thought neceſſary, the expiration through the noſe, though it lays the patient under no ſubjection to either of them.

ALEMBIC, OF FIRE-POT. This veſſel may be uſed for the preparation of oxygene air in this ſimplified apparatus; *but it ought not to be uſed for the preparation of hydro-carbonate air*; for the water coming firſt into contact with the red-hot part of the water-pipe, before it reaches the charcoal, hydrogene air appears to be produced inſtead of hydro-carbonate; at leaſt, it frequently happens that the air prepared from charcoal in this veſſel, has not the power of cauſing vertigo, whereby ſome gentlemen have been diſappointed in the effects expected from the air.

DESCRIPTION

DESCRIPTION

OF A

Portable Pneumatic Apparatus.

PERSONS who have not occaſion for large quantities of factitious airs, eſpecially invalids while upon a journey, will be enabled, by means of this apparatus, to prepare them readily in any ſituation where they can command a common parlour or kitchen fire.

Practitioners in medicine may alſo by means of it, make trial of this new branch of their art, at a moderate expence; but it ought not to be ſuppoſed that it can ſupply the quantities of theſe airs that ſome caſes require, and ſtill leſs, that by means of it a number of patients ſhould be ſupplied.

As oxygene and inflammable airs ought not to be prepared in the ſame fire tube, the apparatus is provided with one for each of theſe ſpecies of air. The fire tube for oxygene air, is made ſomewhat like a pocket liquor flaſk, the flattened form of which permits it to enter between the bars of a common grate. It's dimenſions enable it to contain about a pound of powdered manganeſe, which will generally produce half a cubic foot, or three gallons of air, at one operation.

The figure of this fire tube is delineated in pl. 5, fig. 1, A. and its croſs ſection in its wideſt part at B.

The fire tube for preparing hydro-carbonate air, is delineated at A, pl. 5, fig. 2, and its tranſverſe ſection at B. It conſiſts of two parallel hollow cylinders united together, each open at one end, and communicating with one another at the bottom or ſhut end. The water pipe is adapted to the mouth of one of theſe hollow cylinders, and the conducting pipe, by which the air iſſues, is adapted to the mouth of the other cylinder; ſo that the water, when converted into ſteam by the heat of the tube, muſt paſs through and among the whole matter contained in both of them, before it can make its exit.

This fire tube (C) with its water pipe (F) and conducting pipe (D), together with the airholder, are repreſented in their proper poſitions when in uſe, at fig. 3, pl. 5. It was judged unneceſſary to give a repreſentation of the oxygene fire tube when in uſe, as ſuch repreſentation would differ in nothing from that given, excepting in the abſence of the water pipe, which is not needed in preparing oxygene air.

One joint of the conducting pipe D, is made partly of hammered iron, and the others of tin-plate, japanned. In order to avoid too great nicety in adjuſting the place of the airholder, a ſhort flexible tube is interpoſed betwixt two of the four pieces, of which, for convenience of carriage, the pipe is compoſed.

Either of the fire tubes, when applied to uſe, being previouſly charged with the proper material, is to be introduced between two of the bars of the fire grate; or, if none of the interſtices are wide enough, it may be laid above the upper bar, and the coals heaped over it. If the grate is not deep enough to permit the fire tube to enter far enough into it, when placed at right angles to the bars, it may be put in obliquely; from which the farther advantage will be derived, that the airholder, not ſtanding directly before the fire, may be more eaſily ſcreened from its rays.

The lower end of the conducting pipe turns up a little, and is to be inſerted in the pipe *z* of the airholder, in the manner directed for the ſimplified apparatus.

It is proper, before any operation is commenced, to adjuſt the height of the ſupport of the airholder, and its place in the tub or pail, which is to receive the water; otherwiſe, if the fire tube heats quickly, ſome of the air will be loſt before theſe matters can be adjuſted. In defect of a ſtool, bricks or ſhort pieces of board may be uſed as a ſupport for the airholder; but, where the apparatus is uſed at home, a ſtool will be found moſt convenient.

To prepare OXYGENE AIR, fill the fire tube (of fig. 1, pl. 5) with mangameſe in coarſe powder, up to the narrow part of its neck, lute the end piece E into the fire tube, and introduce the tube into the fire, lute the iron part of the conducting pipe into the end piece, and, when the heat has hardened the lute, apply the other parts of the conducting pipe, previouſly luted to one another. The airholder being filled with water, and ſet upon its ſtool in the tub or pail, uncork the pipe *z*, advance the airholder

Fig. 1.

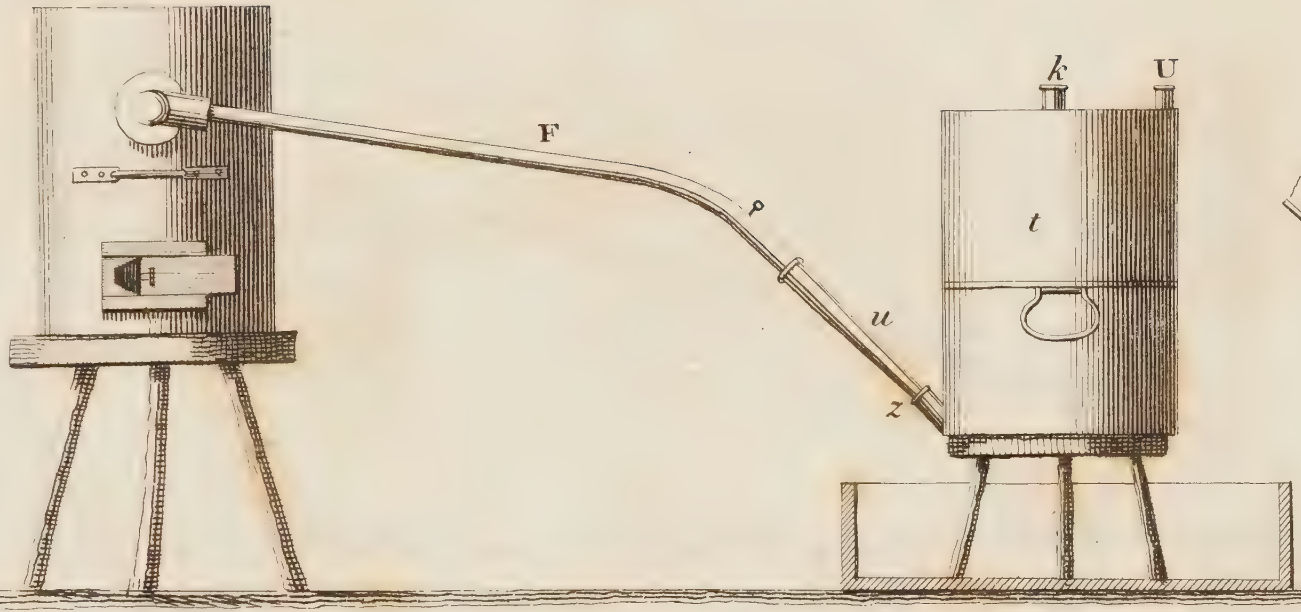


Fig. 2.

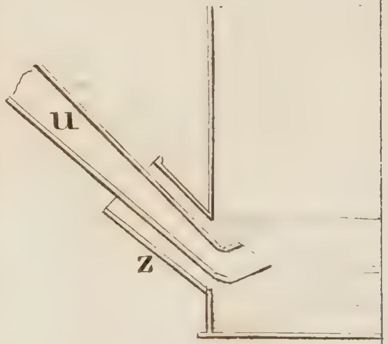


Fig. 1.

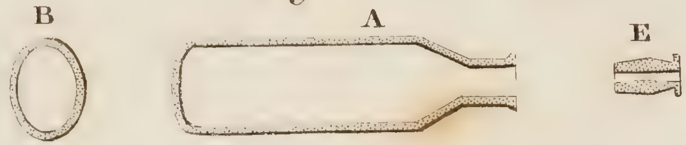


Fig. 2.

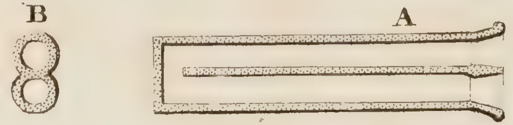
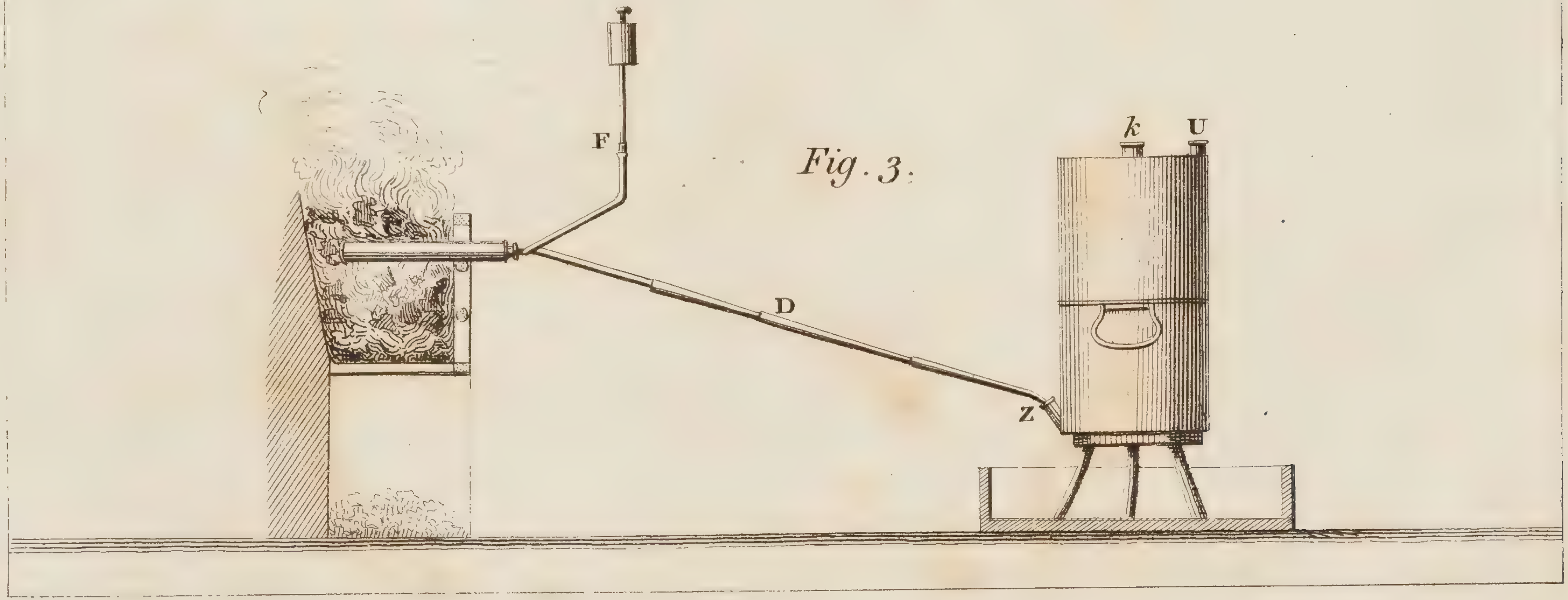


Fig. 3.



airholder, and inſert the end of the pipe D into z. The operation will then go on as has been ſaid in the deſcription of the ſimplified apparatus. When the oxygene air has diſplaced the water, and filled the airholder, the fire tube ſhould be immediately withdrawn from the fire, to prevent the needleſs calcination of that tube. If the joints have been well luted, it may be pulled out by taking hold of the iron part of the conducting pipe, by means of a cloth, to prevent burning the hands.

The end piece ſometimes ſticks very faſt in the fire tube; it may be looſened by ſtriking it gently ſide ways with a ſmall hammer, upon the bead which is formed round its outer end. Violent blows do not anſwer the end, and are apt to damage the end piece.

To prepare HYDRO-CARBONATE AIR, fill both the cylinders of the fire tube, Fig. 2, Pl. 5, with ſmall bits of charcoal, none of them exceeding a quarter of an inch cube; inſert the water pipe into the mouth of one of the cylinders, and the end piece of the conducting pipe D into the mouth of the other, luting them properly; place the fire tube in the fire grate, and when the heat has hardened the lute, proceed to the adjuſtment of the remainder of the apparatus, as has been directed.

When the fire tube has become perfectly red hot, admit water by the water-pipe, pretty freely, in order to expel any noxious matter contained in the charcoal, and ſuffer any air which is thus produced to eſcape. When this part of the operation has been continued for five or ten minutes, reſtrain the water, and bring the airholder into its place. With a proper degree of heat and due exhibition of water, a three gallon airholder may be filled in half an hour, without any ſteam paſſing into the conducting pipe, which is known by the tin parts not becoming hot.

To prevent the water in the cup from being heated by the fire, it is neceſſaty to interpoſe a fire ſhovel, or ſomething ſimilar, to ſcreen the cup from its rays. If the water is ſuffered to boil in the cup; or in the perpendicular part of the water pipe, none will enter the fire tube; therefore it is alſo proper not to fix that part of the water pipe in its place till all the reſt of the apparatus is adjuſted. The airholder may be ſcreened from the heat by a ſheet of brown paper.

The hydro-carbonate fire tube is made double, that the water may paſs through a greater length of heated charcoal, and may act more immediately upon it, and leſs upon the iron; for if the water were tranſmitted ſlowly into a red hot pipe, it would act upon the iron, and produce Hydrogene air before it reached the charcoal; and it appears from experiment, that the hydrogene diſſolves none of the charcoal in its paſſage through it. This has ſometimes happened in making hydro-carbonate in the alembic of the large apparatus, and renders the fire tubes preferable for that purpoſe.

Caution. Though common ſtove grates do not generally produce too much heat for this purpoſe, yet with ſome ſorts of coal, and in particular circumſtances that may happen, and if not guarded againſt, the fire tube may be melted or ſpoiled. A moderate red heat is ſufficient for producing either the oxygene or hydro-carbonate air.

AIRHOLDERS, proper for this apparatus, are two of three gallons each, or one of that ſize, and two of a gallon and a half each. The latter will be found convenient for carriage in a poſt-chaiſe.

PACKAGE. Sets of this apppratus are put up in boxes adapted to them, when ſo deſired, for the convenience of carriage.

POSTSCRIPT.

OBSERVATIONS

UPON

Hydro-carbonate & Oxygene Air.

WHEN a fire tube is uſed for the firſt time, any air which is prepared in it has a bad ſmell: oxygene air in ſuch caſes contains a larger portion than uſual of fixed air, and the hydro-carbonate of ſulphurated hydrogene. Theſe have been with juſtice imputed to the carbone and ſulphur contained in the caſt iron of the fire tube.

With a view to correct this inconvenience, a new fire tube, which yielded very offenſive hydro-carbonate, was looſely filled with dry ſlacked cauſtic lime, and ſubjected to heat: it gave out, as was foreſeen, a conſiderable quantity of ferric hydrogene, not remarkably ill ſmelled. When it ceaſed yielding air, which was after it had been above an hour red hot, it was cooled and filled with charcoal, as uſual for hydro-carbonate; the air it then yielded ſmelled like heated ſteel or burning phoſphorus; in ſhort, it had the ſame ſort of ſmell as hydrogene air. A query then aroſe, whether it had the power of cauſing vertigo. A ſtout young man inhaled a quart of it, mixed with twenty-two quarts of common air, without being in any ways affected by it, which would not have been the caſe, if it had been prepared as uſual. It would then ſeem, that the vertigo is owing to the admixture of ſulphurated hydrogene, which its uſual ſmell indicates this air to contain. If this ſhould prove to be the fact, and any part of its curative powers depends upon its producing vertigo, that effect may be ſecured or augmented, by mixing the borings or turnings of *caſt* iron with the charcoal; or perhaps ſtill better, by the admixture of plumbago, or black lead in powder. If, upon the contrary, the vertigo does not contribute to the cure, the medicine will prove more pleaſant to the patient, and it is believed may be uniformly prepared free from the ſulphureous ſmell, by mixing a little *perfectly cauſtic*, and dry ſlacked lime, with the charcoal powder.

The effect produced upon the tube by the lime, does not ſeem to be permanent; for, in a ſecond operation with the ſame tube, and out of which the charcoal had never been emptied, the air produced had ſome degree of the ſulphureous ſmell.

It has been mentioned, in the firſt part of theſe directions, that a mixture of charcoal powder with ſlacked cauſtic lime, produces an inflammable air, without the addition of water, and that the charcoal is conſumed in the proceſs: and it has ſince been found, that a mixture of hammered iron turnings and charcoal produced very good hydrogene air, and that the iron was perfectly calcined by the operation.

This is not quite the proper place to enter upon theory, yet, as it will naturally be aſked by ſome of my readers, how theſe things are to be accounted for, and I wiſh to throw all the light I can upon the ſubject, I ſhall give the explanation of it which appears to me moſt conſonant to the modern theories, though it has perhaps another cauſe. Slacked lime contains a quantity of water as one of its conſtituent parts, and which it attracts ſo ſtrongly, that it will retain the greateſt part of it even when red hot, provided no attraction more powerful tends to ſeparate it; but red hot charcoal alſo attracts water; and it would ſeem that its attraction for it is ſtronger than that of lime; the latter is therefore diſpoſſeſſed, and left in a *dry* ſtate; and the water, united to the charcoal, forms hydro-carbonate or ſome ſpecies of inflammable air, having charcoal for a baſis. In the caſe of the iron, the ſame thing happens, and hydrogene is formed. Granulated zinc mixed with lime, will probably form zincic inflammable air.

In reſpect to the medicinal properties, all I know is, that the inflammable air from charcoal and lime contained no fixed air, ſeparable by waſhing with quick lime and water, and that it did not cauſe vertigo when inhaled pure.

OXYGENE AIR. This air is alſo rendered more pure and more free from fixed air, by preparing the fire tube, by heating it full of quick lime, as has been mentioned for the hydro-carbonate; then emptying out the quick lime, and filling it with manganeſe in coarſe powder as uſual.

The preparation of the fire tube with lime ſhould be renewed from time to time, whenever an extra produce of fixed air ſhows the neceſſity. It might perhaps be ſerviceable to mix quick lime with the pounded manganeſe; but it has been found, that when the lime was not perfectly cauſtic, it gave out its fixed air, and did more hurt than good, ſerving only to prevent the ſulphureous ſmell that oxygene ſometime has.

Oxygene air ſhould never be prepared in a fire tube uſed for hydro-carbonate or hydrogene.

THE SIMPLIFIED AND PORTABLE

PNEUMATIC APPARATUS,

ARE MANUFACTURED BY

BOULTON & WATT,

OF SOHO, NEAR BIRMINGHAM,

AT THE FOLLOWING PRICES.

THE LARGE SIZE SIMPLIFIED APPARATUS.

The furnace, 18 inches diameter, lined with the beſt fire bricks, tongs and poker, two fire tubes, two end pieces, two rings, iron plug, water pipe and cup, iron conducting pipe and its tin end piece, with one large airholder and funnel	£ 6	16	6

AUXILIARY ARTICLES FOR DITTO.

Two large-ſized airholders, one ſpare fire tube, caſt-iron pot for a ſand heat, two oiled ſilk bags and bellows to fill them with common air -	3	6	0

THE SECOND SIZE SIMPLIFIED APPARATUS.

The furnace, 13 inches diameter, and other articles as above, ſuitable - - - - - - - -	£ 4	15	9

AUXILIARY ARTICLES AS ABOVE.

But the two airholders, ſecond ſize - - -	2	15	0

THE PORTABLE APPARATUS.

One oxygene and one hydro-carbonate fire tube, with end pieces, water pipe and cup, conducting pipe, one ſecond-ſized airholder and funnel, and an oiled ſilk bag - - - -	£ 2	12	6

AUXILIARIES.

One ſecond ſize airholder, two ſpare fire tubes and bellows to fill the bag with common air -	1	2	6

⁂ Packing Boxes and Carriage to be charged extra.

The Pneumatic Apparatus, with Hydraulic Bellows and Refrigeratories, continue to be made as uſual.

See Part II. for the Prices.

Addition to the Supplement.

When this Supplement was printed, it was thought that thoſe who would uſe the Simplified and Portable Apparatus, were already provided with the firſt Part of the Directions; but it appearing that ſuch is not always the caſe, and ſome additional Directions and Precautions having ſince occurred, as uſeful, the following Deſcriptions and Directions, principally applicable to the Simplified Apparatus, are now added.

THE FURNACES are cylindrical, made of ſheet iron, and lined with fire bricks of the beſt kind, ſecured in their places by a ring of iron at the mouth. Two circular holes are made in the oppoſite ſides of the furnace, to permit the fire tubes to be fixed acroſs the centre of the fire, when in uſe. When the alembic or fire pot is uſed in the larger furnace, theſe openings are ſtopt up with plugs of fire brick; and when the fire tubes are uſed, the exceſs of the diameter of the holes over that of the necks of the fire tubes, is ſhut by caſt iron rings which fit the necks of the tubes.

As ſome may have other uſes for the furnaces, there is a fire door hinged to one of the openings, and a chimney pipe adjuſted to the other, which, with a caſt iron pot fitted to the mouth of the furnace, renders it very convenient for a ſand-heat, in which the mineral acids, and other things can be diſtilled. By ſhutting both openings with their brick plugs, it may alſo be uſed for ſuch operations in an open fire as do not require very great heats.

On the one ſide of the aſh-pit is a regiſter, or ſliding damper, by which the admiſſion of air, and the heat of the fire may be regulated; for even in the proceſſes for producing the factitious airs, though no chimney is uſed to make the furnace draw, if the coaks are good, the heat ſometimes riſes ſo high, as to injure the fire-tubes. On the other hand, ſome coaks are ſtubborn, and burn ſlowly; in which caſe a tunnel, ſuch as is deſcribed in this Supplement, (p. 10) is uſeful; but it will require attention on the part of the operator to avoid the injury juſt mentioned.

The furnace for the larger apparatus, is 14 inches diameter within the lining, and 18 inches over all; the depth to the grate is 11 inches, and the depth of the aſh-pit about 7 inches.

The furnace of the ſmaller apparatus is 9 inches diameter within, and 13 inches over all; the depth to the grate is 9 inches.

The FIRE TUBES are of two kinds; thoſe for oxygene air are now made to ſhut at one end, principally to prevent their being accidentally uſed for making inflammable air: the other end is open, but ſomewhat contracted, that it may require a ſmaller end piece: this contracted part forms a cylindrical neck, which extends through the thickneſs of the brick lining, and to which the caſt iron ring is fitted. The remainder of the tube is cylindric.

The fire tubes for the inflammable airs are ſimilar to the other: only that they are open at both ends, that the water neceſſary for the production of theſe airs may be admitted at one end, while the air iſſues at the other. To the open ends of the fire tubes are fitted *end pieces*, ground conically to a joint with the inſide of the neck of the tube, beyond which the end pieces are bent at right angles; one of theſe bent parts ſtands perpendicular, and its perforation receives the lower end of the *water pipe*; the other, which is wider, lies horizontally, and receives the end of the conducting pipe F, to which it may always remain attached. The oxygene fire tube has only one end piece, which fits the conducting pipe. The other, or cloſe end of this fire tube, when in uſe, is ſupported upon a piece of caſt iron fitted into the hole in the furnace.

The WATER PIPE has a cup on its upper end, the mouth of which is croſſed by a bridge of iron, through which is ſcrewed a wire, conical at the lower end, which ſtops the orifice of the pipe, and as it is ſcrewed up or down, admits more or leſs water, or entirely ſtops the hole. The lower end of the water pipe is ground into the perpendicular opening of the end piece which belongs to it; and when in uſe this pipe ſhould ſtand perpendicular. The conducting pipe F is ſhewn in the drawing, and has been deſcribed.

The ALEMBIC, or FIRE POT. This veſſel is only uſed in the largeſt apparatus, and is very convenient for making oxygene air, but does not anſwer ſo well for making hydro-carbonate air, as has been mentioned; therefore theſe veſſels are not now fitted with water pipes, unleſs particularly ordered. They have the advantage that they can be uſed in almoſt any furnace that is large enough, or even in a wide kitchen grate: but, as the manganeſe lies more in a maſs in them than in the fire tubes, the operation does not go on ſo ſpeedily as with the latter, and part of the manganeſe towards the centre does not yield all its air.

AIR-HOLDERS. One of theſe veſſels is repreſented in pl. 4, k, U, fig. 1, and the manner of uſing it in the ſimplified apparatus is explained in pages 4 and 5 of this Supplement. They are made of tin-plate, japanned inſide and outſide. They are joined in the middle by a cement of four parts bees' wax, and one part of common roſin. By warming the joining before the fire, they can at any time be taken aſunder and cleaned; and joined again with the ſame cement applied hot. The centre pipe k, reaches very near to the bottom of the veſſel; and the other pipes, U and z, merely enter it. The uſe of z has been explained, page 4; and that of the others ſhall be explained in deſcribing the manner of transferring the air into the ſilk bags. Air-holders are made of three dimenſions; the largeſt contains ſix gallons,

lons, or a cubic foot of air; the middle ſize three gallons, and the ſmalleſt one gallon and a half.

The OILED SILK BAGS are commonly made to contain from 20 to 24 ale quarts of air. They are found to be more convenient to inhale the air from, and to tranſport it from one room to another, than any other exiſting contrivance. They will contain the air for ſome hours, but it is beſt to fill them immediately before the air is uſed. The dimenſions ſtated anſwer very well in common practice, where the doſe of the *factitious* air does not exceed three pints; but, where larger doſes are required, it is adviſable to have larger bags made on purpoſe. Smaller bags, which contain in all only a quart or two, are made for taking out ſmall quantities of air for trials of its quality, or to perform philoſophical experiments.

When the ſilk bags are out of uſe, they ſhould be hung up by a ſtring tied to the neck of the faucet; folding or creaſing them is hurtful. When they meet with any accident, the hole may be mended by paſting over it a patch of oiled ſilk larger than the hole, by means of japanner's gold ſize, or any other tough linſeed varniſh. Both the patch and the circumference of the hole ſhould be anointed with the varniſh, and ſuffered to dry till it is juſt ſticky to the finger; when the patch ſhould be preſſed down on its place, and allowed to dry before the bag is again uſed.

MANGANESE, for the purpoſe of preparing oxygene air, ſhould be free from calcarious earth and noxious minerals, ſuch as lead, arſenic, or copper. A very good kind is found near Exeter, which ſeems to poſſeſs theſe properties.

The preſence of calcarious earth may be detected by pouring diluted nitrous acid upon the powdered manganeſe; for, if it contain any, there will be a *continued* effervеſcence, which otherwiſe would not take place. The other minerals may be detected generally by the eye, and always by the known chemical eſſays. The Mendip manganeſe, which is always mixed with calcarious earth, alſo frequently contains ſmall portions of lead.

The very beſt of the Exeter manganeſe has a chryſtallized fracture, with ſomewhat of the appearance of a lead ore, though of a darker colour: another good kind is amorphous in its fracture, and very hard: that which is very tender, and of an earthy or ruſty appearance when broken, does not generally contain ſo much air, though what it contains is equally pure. All theſe kinds are found in the ſame vein, and are unavoidably mixed in the parcels; ſometimes alſo there are ſmall lumps of a brown ſtone, with whitiſh ſpecks, like toadſtone, among it; which will be eaſily diſtinguiſhed in breaking it, and ſhould be rejected, as they contain fixed air.

A pound of the hard part of Exeter manganeſe yields about 1400 cubic inches of air, nearly pure oxygene, with a very ſmall quantity of fixed air.

The fire tubes, or the alembic of the large apparatus hold about ſix pounds of pounded manganeſe, which yields generally from four to five cubic feet of oxygene air; and thoſe of the ſmaller apparatus contain about three pounds of manganeſe, and yield from two to two and a half cubic feet of air. The fire tube of the portable apparatus holds one pound, and produces about half a cubic foot of air.

CHARCOAL, for making hydro-carbonate air. The beſt is that of the ſofter woods, avoiding that of oak and fir. It ſhould be prepared by heating it to full ignition, either in a covered crucible, or in an open fire, and then extinguiſhing it by means of water, or by putting it in a clean earthen veſſel cloſely covered. When uſed, let it be broken into ſmall bits, or coarſe powder, which, with the fine duſt ariſing in breaking it, are to be put into the fire tube.

IRON TURNINGS or BORINGS. Thoſe made from hammered iron produce hydrogene air more pure than thoſe of caſt iron. The latter contain carbone and ſulphur in conſiderable quantities; and the air made from them partakes of the nature of hydro-carbonate. Theſe turnings and borings of both kinds are ſometimes contaminated with oil or greaſe, from which they may be freed by heating them red-hot in a crucible, and quenching them in water.

FIRE-LUTE. To join together the parts of the apparatus which are expoſed to conſiderable heat, take China or Porcelain clay from Cornwall *(not pipe clay)*, pound it, and mix it to the conſiſtence of thick paint, with a ſolution of two ounces of borax, in a pint of hot water; or in default of China clay, ſlacked quicklime, mixed up in the ſame manner, may be uſed. This lute may be kept ready mixed up in a covered pot.

Cold-lute, for the joints of the conducting-pipe, and corks of the air-holders, take equal parts of china clay and wheat flour, by meaſure, and mix them to a proper conſiſtence with cold water. This lute is more tenacious than the other, but it does not keep well; the other may in general be ſubſtituted for it.

Fuel. The moſt manageable for the furnaces is good coaks, or cinders of pit coal, in pieces not leſs than a walnút, nor larger than a gooſe egg. Charcoal of wood alſo anſwers very well, but is more expenſive. Some uſe ſmall pieces of clear-burning pit-coal, free from ſulphur, and not charred or coaked; but ſuch coals cannot be had every where.

DIRECTIONS

FOR

Uſing the Apparatus.

HYDRO-CARBONATE AIR. This proceſs being more complicated than that for making oxygene air, is firſt deſcribed.

Put one of the iron rings which ſerve to fill up the openings in the ſides of the furnace, upon the neck, or ſmall part of that end of the fire tube which you deſtine for the water pipe. Anoint the conical part of the end piece belonging to it with ſome of the fire lute. Inſert the end piece into the opening of the fire tube; preſs it in, twiſting it a little round; then give it a gentle blow with a piece of wood, or a ſmall hammer, to force out the ſuperfluous lute, which ſtroke up round the joint. Raiſe the tube upright upon that end piece, and put into it firſt ſome largiſh bits of charcoal, to avoid choaking the end piece; then, by the help of a wide funnel, put in the ſmall charcoal, till the tube is quite full up to the other neck; ſtriking the tube on the ſides from time to time, to make the charcoal ſubſide. Stop the open end with the iron plug, or a large cork, and paſs the fire-tube through the holes in the furnace made to receive it; put the other iron ring upon the other neck, ſo as to fill the hole in the furnace on that ſide; take out the plug, and turn the tube round, till the bent part of the end piece for the water pipe ſtands upright. Then, having luted the end of the conducting pipe into the other end piece, anoint the conical part of that end piece with fire lute, and put it into its place in the fire tube, as has been directed for the other; taking care that the conducting pipe lie at the proper inclination to the horizon, as ſhewn in plate 4. When the water pipe ſtands perpendicular, the inclination of the conducting pipe will be in that part governed by the height of the ſupport of the air-holder, which, with the place of that veſſel in the tub, ſhould be regulated before you fill the fire-tube. The lower end of the water pipe ſhould now be anointed with lute, and twiſted into its ſocket in the end piece. The wire ſhould be ſcrewed quite down, a little water put in the cup, and the whole left at reſt until the fire tube is red-hot. The proceſs is then to be managed as has been directed in this Supplement, pages 17 and 18.*

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* In the preparation of hydro-carbonate air, no water ſhould be admitted until the fire tube has been for ſome time red-hot. It is alſo found preferable to reduce the charcoal to ſmall bits, or to a coarſe powder; and in the portable apparatus to change the charcoal, putting in freſh at every operation; otherwiſe air will be produced which has not the power of cauſing vertigo.

To extinguiſh the Fire after the operation, ſhut the aſh-pit door and the air-regiſter, and lay an iron plate upon the mouth of the furnace; the fire will then be ſoon extinguiſhed, without damage to the fire tube.

FERRIC HYDROGENE, and alſo FIXED AIR from Chalk, are to be managed exactly in the ſame manner, only that, eſpecially in the latter, the heat muſt be ſomewhat greater than is neceſſary for charcoal, ſay a *full* red heat, and the chalk broken into bits not exceeding one-third of an inch ſquare.

In all theſe proceſſes care muſt be taken that the fire tube be quite filled with the material from which the air is to be produced; otherwiſe the ſteam will paſs over without ſuffering or cauſing any decompoſition.

By mixing about one-ſixth in bulk of caſt iron turnings or borings with the charcoal, you will be more certain of obtaining air which has the power of cauſing vertigo; and by mixing about one fourth in bulk of freſh-ſlacked lime with the charcoal, the air produced will not cauſe vertigo. This air I call *pure* hydro-carbonate, the medicinal powers of which are not yet aſcertained.

ZINCIC, or FERRIC HYDROGENE, may be obtained by mixing about two ounces of granulated zinc, or the ſame quantity of iron turnings, with a pound of recently ſlacked lime in the oxygene fire tube, and applying heat without water, as for oxygene.*

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* Slacked quick lime may be kept for any length of time quite freſh, or cauſtic, by preſerving it in a well-corked glaſs bottle.

OXYGENE AIR is prepared according to the directions in page 16; great care ſhould be taken that no bits of coals, charcoal, or other combuſtible matter, be mixed with the manganeſe; otherwiſe ſuch mixture would cauſe the production of a very pungent fixed air, which would be deleterious in caſes where oxygene is proper. Manganeſe may be examined for its contents in lead or copper, by diſſolving it by heat in the muriatic acid diluted; the lead will remain in the form of a whitiſh calx, and the copper will be made ſenſible by the addition of volatile alkali turning the ſolution green. Manganeſe calcined in cloſe veſſels, with charcoal, becomes green; which has led ſome people into the error of ſuppoſing it to contain copper; whereas calces of copper heated red hot become red. Oxygene air ſhould be kept in the air-holder for twelve hours, that it may depoſit the manganeſe which comes over with it, before it is uſed.

TO TRANSFER THE FACTITIOUS AIR from the air-holders into the bags. All the pipes of the air-holder containing the air being corked, the ſhort pipe U is to be uncorked, and the nozzle or faucet of the bag wrapped round with a ſlip of ſoft rag, wetted, and tied on by a ſmall thread, is to be forced *tight* into that pipe. Then, and not before, uncork the centre pipe K, place the funnel in K, and pour in a meaſure of water, equal to the quantity of air wanted for a doſe, holding up the bag with your hand, that the air may meet with no reſiſtance, the deſired quantity will be transferred into the bag. Having replaced the cork in K, ſhut the orifice of the faucet, by putting your thumb upon it, on the outſide of the bag, remove the faucet from the pipe U, and cork that pipe.*

The bag is to be filled with common air, by inſerting the faucet into the nozzle of the common bellows, to be had with the apparatus, and blowing with them till the bag is about half full ; when it ſhould be gently clapt on the ſides, in order to mix the common and factitious airs. After which it is to be blown completely full ; and the faucet being corked or ſtopped with the finger, it is to be removed to the place where it is to be uſed.

It is a bad practice to put the doſe of factitious air into the bag, and ſend it in that ſtate to the patient at a diſtance, to be there filled with common air : the factitious air either eſcapes, or may be contaminated by the bag, ſo that little effect may be produced. The air-holder appropriated to the patient ſhould ſtand in his apartment, unleſs he reſorts to the practitioner's houſe. Air-holders ſhould be appropriated to each ſpecies of air, and ſhould be properly labelled to prevent miſtakes. They ſhould be kept in a cool place of an equal temperature, and the corks ſhould be good and tight. If ſent to a diſtance, they ſhould be packed in a locked baſket or box, to prevent injuries.

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* The ſlip of rag ſhould be very neatly wrapt round the faucet, and always wetted at every time of uſing ; otherwiſe the air may eſcape by the ſide of it, inſtead of entering the bag ; and the bag ſhould always be held up by the hand, and kept from ſuch folds as might impede the entrance of the air. When the bag is clapt on the ſides, the faucet ſhould be ſhut by the finger.

INHALATION OF THE AIR is performed by taking the point of the faucet between the lips, inhaling from the bag through the mouth, and expelling the air from the lungs through the noſtrils; which operation moſt patients readily acquire a habit of performing with eaſe: but thoſe who cannot do it, may uſe the mouth-piece, deſcribed p. 11. It ſhould be recommended to patients not to hurry themſelves, to inhale gently, and to retain the air a little in their lungs before they expel it. It is alſo proper, eſpecially in the uſe of the hydro-carbonate, for the patient to reſt a little at every five or ſix inhalations, to obſerve whether any vertigo takes place: and even in uſing oxygene, an unexperienced patient ſhould reſt to avoid fatiguing the lungs, which of itſelf may cauſe ſome giddineſs.

DOSES OF THE FACTITIOUS AIRS. Where ſymptoms do not decidedly indicate larger doſes, it is prudent to begin with a pint of oxygene air, in a bagful or half a bagful of common air, that is to ſay, diluted with from 20 to 40 times its bulk of common air, and gradually to increaſe the doſe as ſymptoms direct; obſerving always to dilute with at leaſt 20 times the quantity of common air.

This doſe may be thought too ſmall to produce ſenſible effects; but it will frequently produce very conſiderable ones; and in ſome caſes, where the ſyſtem is very irritable, may prove an over-doſe.

Patients with a ſlow firm pulſe, will generally bear large doſes; but thoſe with ſlow feeble pulſes, are generally more readily affected by it. In diſeaſes occaſioned by want of irritability, very large quantities have been given before any effect was produced, even ſeveral cubic feet per day; but, as in ſuch caſes the oxygene was given little diluted or pure, it appears probable that more was given than would have been neceſſary, had it been ſufficiently diluted; for, if pure oxygene air is inhaled, it will be found, upon its emiſſion from the lungs, to be ſtill highly dephlogiſticated; but, when diluted, it has more time to act, and more of it is probably abſorbed.

The hydro-carbonate having powerful effects in cauſing vertigo, ought always to be adminiſtered cautiouſly: where there is much debility, it may be prudent to begin with half a pint of this air, diluted with 10 or 20 pints of common air, to be increaſed in the ſubſequent doſes, till each doſe ſhall cauſe vertigo: how far the latter effect ſhould be puſhed, muſt depend upon the ſituation of the patient, and the nature of the diſeaſe. Patients with a *strong* quick pulſe, can in general bear large doſes of this air, and its immediate effect is rendering the pulſe ſlower; whereas in patients with quick *weak* pulſe, it generally renders the pulſe quicker and weaker immediately after the inhalation; though its ſubſequent effect is to render the pulſe ſlower and ſtronger, if it takes effect upon the diſeaſe.

It has ſeldom been found neceſſary to give more of this air than from two to three quarts per day, until the patients have been long habituated to the uſe of it; and in all caſes where the air has ben very lately made, it is proper to give only half the uſual doſe; but, after four or five days keeping, it ſeems to ſuffer little further change. The oxygene air keeps good for months, if the corks are good.

To enable practitioners to judge of the ſize of the apparatus which their practice may require, the quantities of oxygene air which each ſize can produce at one operation are recapitulated.

The largeſt apparatus can produce about four cubic feet at one operation; which will require four of the largeſt, or eight ſecond ſized air-holders to contain it; a great number of air-holders may be neceſſary, becauſe ſome patients may require the air to be ſent out to them, and may not uſe it ſo faſt as others. In ſuch caſes, eſpecially where the adminiſtration of the air is likely to be continued ſome time, it would ſeem reaſonable that ſuch patients ſhould pay for their own oiled ſilk bags, if not for the air-holders.

The ſecond ſize apparatus will produce about two cubic feet of oxygene air in each operation; which will require two largeſt, or four ſecond ſized air-holders to contain it.

The portable apparatus produces three gallons of oxygene air at each operation; which requires one ſecond ſize, or two ſmalleſt air-holders to contain it.

As the charcoal does not waſte faſt in the operation for hydro-carbonate air, the operation may be continued with propriety until double the above quantities are produced in the reſpective apparatuſſes; but it is evident, that in ſuch caſes, a proportionate number of air-holders muſt be provided for this air, in addition to thoſe required for oxygene.

From the above it will appear, that the largeſt apparatus is neceſſary for hoſpitals, practitioners of great practice, or who do not chuſe to reſort often to a freſh operation: the ſecond ſize to practitioners of more confined practice; and the portable apparatus to patients who chuſe to prepare their own airs, and to gentlemen who wiſh to try experiments. To thoſe who require conſiderable quantities of air, the frequent repetition of the proceſs with this portable apparatus will be found troubleſome; and it is further to be remarked, that the conſumption of fire-tubes is leſs in proportion to the quantities of air produced in the larger than in the ſmaller apparatus; and that nothing will tend more to avoid unneceſſary repetitions of operations, than the being provided with a ſufficient number of air-holders, or other proper recipients for the air.

The ſmalleſt air-holders, containing ſix quarts, are convenient for ſending out air to patients at their own houſes.

OXYGENE FIRE TUBES, when new, ought always to be prepared by filling them with freſh ſlacked lime, and keeping them an hour red-hot, as has been directed above; but Hydro-carbonate tubes ought not to be ſo prepared, otherwiſe the air obtained from them will not have the power of cauſing vertigo.

BOULTON & WATT *beg leave to inform Gentlemen ordering the Pneumatic Apparatus, that the articles called* AUXILIARY *are neceſſary to the Apparatus, and that in general greater numbers of Air-holders and Silk Bags are wanted than what is ſpecified; which, however, can be ſupplied at any time on ſhort notice, as well as the following articles:*

Beſt picked Exeter Manganeſe.
Caſt Iron Borings.
Corniſh China Clay, for Lute.
Borax for ditto.

SETTLEMENT

OF

AN ACCOUNT OF FACTS

BETWEEN

THE EDITOR

AND

A COUPLE OF CRITICS.

SETTLEMENT

OF AN

ACCOUNT OF FACTS.

In the XXXVIIIth No. of a certain Review, an attempt has been made to diſcredit the facts, affirmed by Sir Jeremiah Morriſon.—" *The whole*" it is remarked, " SEEMS *a flimſy fiction.*"—Theſe ſcruples, if the profeſſions in the Review are ſincere, had in part an honourable intention. They are *ſaid* to have ariſen from the flagitious nature of the facts, and from a probable and obliging ſurmiſe, that the Editor of the Collection of Caſes fell upon the fiction, as likely to promote the ſubſcription to his propoſed inſtitution for inveſtigating the medicinal effects of gaſſes, and to gain him proſelytes. Were the queſtion to be determined by internal evidence, it is not likely that the former reaſon would weigh much with thoſe who are acquainted with the effects of zeal.——For the latter, as the Editor has direct teſtimony in hand, he will not trouble himſelf to uncover its nakedneſs. In producing teſtimony on the ſubject of the *enraged Apothecary*, he thinks it proper to re-aſſert, that a full a full authenticated narrative was ſent to him for publication in Part III. It appeared, however, to him, ſufficient to ſtigmatize the tranſaction in general terms.

"*The Apothecary, whom you mention in your work,*
"*actually delivered in his bill, and threatened arreſt, wholly*
"*becauſe my patient, Mr. D——, determined to inhale the*
"*vital air. Before, they were in habits of great intimacy.*
"*If you chooſe to publiſh this in compliment to the British*
"*Critic, you have my permiſſion as well as that of my*
"*patient.*

R. J. THORNTON."

On this point the Editor will only add, that, however he may be diſpoſed to compliment the Review in queſtion, he prints the atteſtation with a view to ſatisfy the public, that the imputation was not thrown out at random.

The Editor would have been glad to inſert an atteſtation concerning the incident between the Baronet, his lady and daughter, and the CANDID Doctor. But the practitioner, from whom he received an account of it, and who had his information from the firſt of the above-mentioned four parties, deſired that his name might by no means be brought forward to the public, without a call ſufficiently reſpectable, or ſufficiently urgent.

In the ſame article of criticiſm, ſeveral miſtakes and inaccuracies, though not perhaps of any great moment, might be pointed out. The Reviewer ſpeaks of the

" FORMIDABLE *apparatus with which the airs are ad-" *miniſtered.*" Thoſe who have read the deſcription of Mr. Watt's apparatus, ſo as to underſtand it, or have ſeen the thing itſelf, will be amuſed with ſuch a character of a varniſhed ſilk bag, furniſhed with a faucet. For ſuch is the apparatus with which, according to the directions in the pamphlet, and the general practice, the airs have been adminiſtered. Another inaccuracy occurs in the following ſentence : " *The Editor after all consoles* " *himself with the hope, that if this country should ungrate-* " *fully reject his inventions, they will be adopted by the* " *French.*" This is not true. The Editor drops not a ſyllable of complaint or deſpondency, of hope or conſolation. He ſimply expreſſes an aſſurance that the French, who have made ſuch capital diſcoveries in pneumatic chemiſtry, will not fail to cultivate pneumatic medicine.

The paſſages where this Reviewer talks of *regular physicians*, p. 590. of *Myersbach and Brodum*, p. 592, the Editor at firſt conſidered as intended to inſinuate calumny, and to form injurious aſſociations. While this impreſſion laſted, he laboured under the very weakneſs which a late lively writer has thus deſcribed from his own feelings :—" *Comme l'humanité est foible! J'ai été assez bête* " *pour être sensible à vos insinuations calomnieuses. Peu* " *s'en est fallu que je ne me sois emporté avec violence con-* " *tre Monsieur le Rapporteur qui se presentoit alors a mes* " *yeux comme un imposteur aussi maligne en intentions,* " *qu' impudent en suppositions.*

" *Vous entendez bien, Citoyen, que tout cela n'étoit que* " *l' effet du premier moment.*"

No wonder the Editor ſhould ſo ſoon correct himſelf. He had only to call to mind the firſt motive for diſbelieving the Baronet's facts; which ſhews the writer to be gifted with the innocence of the dove. However, therefore, he may fare as to the cunning, he ſurely cannot harbour the venom, of the ſerpent.

This acknowledgment, it is hoped, will repair the momentary injuſtice of an imputation of malice. If not, the Editor profeſſes himſelf willing to do all further in his power. As nothing more likely to be acceptable occurs, he thus publicly offers his intereſt to bring the Reviewer acquainted with the venerable Baronet. In ſentiments and morals he believes them perfectly ſuited to each other; and how agreeably muſt the anonymous, but *not unknown*, gentleman be ſurpriſed, at finding himſelf by Chriſtmas cloſely leagued in friendſhip with a perſon, whoſe exiſtence he queſtioned at Midſummer!

THE ſecond Critic, againſt whoſe ſtrictures the Editor has to tender a bill of exceptions, is a writer in the *Medical and Chirurgical Review*. An article in No. XIII. affords a curious example of the levity with which ſome people will hazard aſſertions, when they are ſheltered from reſponſibility and ſhame. P. 614 of the Medical Review it is ſaid, concerning the two well-known cancerous patients at Bath, "We underſtand them to have "fallen victims to this dreadful diſeaſe. A ſpeedy recur"rence of the ſymptoms took place, which the remedy

" had no longer a power of mitigating." Anxious for a repetition of the intereſting experiments of the late Mr. Magellan and Dr. Ewart, the Editor had ſought every opportunity of ſatisfying the public, that mitigation of the pain of cancer, for an indefinite time, might be expected from the application of carbonic acid gas.

In Part III. of his Conſiderations, he adduces the authority of Dr. Ingenhouſz, who ſpeaks from perſonal enquiry and inſpection. According to this accurate phyſician, " the ulcer gives no pain when the air is applied," and " it always is better for the remedy." Dr. I.'s letter is dated Oct. 12, 1795. At a ſtill later period, Mr. Sandford found the patient kept " *compleatly easy*," by carbonic acid air. See his letter of Jan. 19, 1796, in the 3d edit. of Parts I. and II. of the preſent publication, p. 128.

THE Editor ſolicited permiſſion from theſe two Correſpondents, to publiſh the reſult of their obſervation and enquiry. For falſe reports concerning theſe patients had been induſtriouſly circulated; and whatever might be the intention of ſuch reports, their tendency was to diſcourage further trials. The aſſertions, ſo confidently advanced in the Medical Review, have induced him to apply for ſtill further information, which he here lays before the public.

BATH, *Aug.* 26, 1796.

DEAR SIR,

IN anſwer to your enquiries reſpecting the two Caſes of Cancer which I formerly publiſhed, I have the pleaſure to inform you that Alford, the ſubject of the firſt caſe is not dead, as has been reported. Sometime after her diſmiſſion from the Infirmary, the breaſt again ulcerated, the carbonic acid air was again applied with relief to the pain, but although perſiſted in for a long time, the ſore did not, as before, aſſume a diſpoſition to heal. It remained however eaſy. * have no doubt contributed much to increaſe her complaint, and rendered it neceſſary that ſhe ſhould be diſcharged.

The other patient died ſeveral months after the publication of my pamphlet. She continued to the laſt to apply the air, which kept the ſore uniformly free from pain, and prevented its ſpreading. She had a complication of other complaints latterly, much more diſtreſſing to her than the cancer, and fully ſufficient to occaſion her death; particularly an inceſſant cough, to which ſhe had been more or leſs ſubject for ſome years, with a profuſe expectoration of very unſeemly matter, and great difficulty of breathing. She was alſo attacked with frequent and ſevere nephritic pains, accompanied by fever, which in the courſe of ſome days were commonly relieved by a diſcharge of calculous concretions by urine, of conſiderable ſize.

I am, dear Sir,

Your's, &c.

J. EWART.

To Dr. Beddoes.

THE Editor knows not whether the Medical Reviewer will become more circumſpect in future; but his readers will probably perceive what ſort of a genius he is for affirmation.

It would be eaſy to aſſign a ſatisfactory reaſon why the carbonic acid was not conſtantly applied to ******. But the Editor does not chooſe to drag an unfortunate woman's frailties into day, in compliment to a blundering Reviewer. Let him make enquiry for himſelf; and, if he gets as good information as before, he will acquaint the world that the miller of Billericay himſelf, after he had determined not to be fat, was not ſo remarkable for abſtemiouſneſs from all liquids, as the poor patient, whom he, dead-doing critic! has demoliſhed at one ſtroke of his gooſe-quill.

Theſe are facts, which can admit no diſpute. In the ſame 13th Number are to be found opinions no leſs unwarrantable than the aſſertions are falſe. The Editor is ſorry to obſerve either the one or the other, in a publication which he had often praiſed for impartiality, and for which he thinks practitioners, remote from collections of books, obliged to Mr. Booſey.

" The application of the new chemical doctrines to " the philoſophy of medicine, continues to be purſued " by Dr. Beddoes and his coadjutors, with unabated " induſtry. Additional proofs are daily afforded of the " great influence of factitious airs on the animal ſyſtem. " We are ſorry, however, to obſerve ſo ſtrong a tendency to ſpeculation in the propagators of this doc" trine. There is much reaſon to fear, that truth will be " for ſome time obſcured, rather than developed, by the " enthuſiaſm of this claſs of enquirers. That the haſty " adoption of their doctrines ſhould meet with much " oppoſition from the faculty, was naturally to have " been expected. Men accuſtomed to think in a cer" tain train, impoſed by education and early acquired " habits, are not to be ſhaken in their opinions by every " doctrine that wears the face of novelty. Indeed, the " cauſe of truth is in all probability much ſerved by this " very caution, which has been ſo much ridiculed. New " doctrines have frequently ariſen, which have worn as " impoſing an aſpect as thoſe of the aerial projectors; " which yet time and further enquiry have as frequently

" overturned. By this early oppoſition the authors of " novel opinions are obliged to furniſh themſelves with " new weapons, if any ſuch are to be found, in their " defence. *The acrimonious attacks, therefore, which have* " *been made by this new ſect,* ON ALL WHO FOR WANT " OF CONVICTION, *withhold their aſſent to their con-* " *clusions*, are not more repugnant to reaſon in them-" ſelves, than unavailable to the ſupport of the cauſe " they have undertaken to ſupport. Had they recol-" lected what took place at the introduction of the cir-" culation, and on many other memorable occaſions of " diſcovery, they would ſee how little reaſon there was " to apprehend that their opinions would be borne down " by authority, without the appeal to impartial enquiry."

This occurs in p. 601, and in p. 613, the writer returns to the charge. As Dr. Beddoes is the only perſon here named, and as the whole paragraph muſt ſeem levelled at him along with others, if not at him excluſively, he thinks that if it had not been intended to involve him, he has a right to charge the Reviewer with culpable inadvertence, in not expreſsly excepting him. If ſuch was the intention, he has ſomethingfurther to ſay.

Dr. B., did he poſſeſs ſufficient abilities, would diſdain to waſte them in maintaining a Warburtonian deſpotiſm over medical literature. He has ſpoken, and may again ſpeak, with aſperity of perſons who endeavour by *immoral means to stiflle investigation.* And he ſhould not be ſorry, if he could remove that barbarous antipathy to the advancement of knowledge, under which ſome few Doctors ſtill labour. But what has this to do with attacking *any one,* much more " *all who for want of conviction,* " *withhold*

“ *withhold their assent to*” his “*conclusions?*” A diſtinction, ſuch as this, is pretty obvious; though people ſometimes may not obſerve, or may not chooſe to obſerve, it. Shortly after the appearance of Moliere's *Avare*, a Harpagon in real life was heard to complain, that “ *no decent careful housekeeper could live in peace, for*,” added he, “ *a man must now-a-days turn spendthrift, if he will not be exposed by these profligate playwrights.*”

In the foregoing quotation, the terms, “ doctrines,” “ coadjutor,” “ ſect,” all convey an invidious, and as far as the Editor is concerned, an abſolutely falſe meaning. He originally denominated his ideas on the action of gaſſes *conjectures*, and has always ſince repreſented them as nothing better. He has not heſitated to quit and to diſavow them, whenever he has found them inconſiſtent with facts. Fearful that it might not be in his power to render eſſential ſervice to medical ſcience, he early determined to guard againſt entangling his underſtanding in the cobwebs of his own hypotheſes. In particular caſes he has doubtleſs ſeen gaſſes ſalutary beyond any means known to him. But he has been careful to ſtate that he would not “ *give the smallest assurance of success*,” in any one denomination of diſeaſe.——(*See the outline of a plan for a Medical Pneumatic Institution.*)——In the beginning of the laſt century, a noted Doctor on the Continent raiſed a loud outcry about his *gas* and his *blas*; and unbluſhingly boaſted, “ *Nova morborum principia, ut et hactenus inaudita theoremata dedi ac demonstravi.*”—But is his an example for any man of common prudence to imitate now-a-days ?

The word "*ſect*," denotes a number of people, having certain dogmas in common. The Editor agrees in diſpoſition with thoſe, who are ready to exert themſelves to improve the art of healing. He is determined to ſeize any promiſing means whatever that may conduce to this purpoſe. Nor has he any the ſmalleſt predilection or prejudice towards ſolids, liquids, aerial or ætherial fluids, as the fixed letter of his publications will atteſt. With the opinions or works of others, he has nothing to do. He ought not therefore to ſhare their praiſe or blame. He has never been privy to the deſign or execution of any publication reſpecting pneumatic medicine, except ſuch as bear his own name. And he has been much leſs hurt by all the cenſure than by ſome applauſe which he has incurred.

"*Opinions borne down by authority!*" He has ever been a ſtranger to ſo pitiful an apprehenſion; nor did he require to be ſchooled by a ſtupid rehearſal of *ſententiae aniles*. Concerning this enquiry, he had often enough expreſſed his firm perſuaſion that nothing could arreſt its progreſs. But menaces or artifices, ſuch as he knew on good authority to have been actually employed, might in the mean time prevent this and that individual from obtaining ſuch benefit as the external or internal uſe of airs can afford. This alone was a ſufficient motive for expoſing the practices to which recourſe has been had.

The various miſeries of mankind have from time to time ſuggeſted various remedial plans to the Editor. Of theſe he has ſuppreſſed ſome, and given very ſlight intimation of others. For they were ſuch as his contemporaries (according to his eſtimate of their receptivity) would not reliſh, becauſe they had not yet been laſhed by the bloody ſcourge of ſtateſmen into a ſufficient knowledge of what is good for them. He fancied, however, that they might be brought to perceive the propriety of inveſtigating the curative powers of elaſtic fluids. Inſtead therefore of deſigns of greater utility perhaps, but more remote from current notions, he has taken pains to recommend this, and he hopes with eventual ſucceſs.

On other points, the Editor has the misfortune to be diſſatisfied with the repreſentation given by this cautious and well-informed cenſor of medical authors. In p. 603, for inſtance, Mr. Herdman is ſaid to have refuted the opinion that the excitability of the animal fibre depends on oxygene. Dr. Girtanner, with whom no one individual perhaps in this country has declared his concurrence, may indeed have been refuted. The taſk was truly eaſy. But that the oxygene received in reſpiration, and diſtributed to the muſcles, combines with azote, hydrogene, and carbon, to form water and various ſaline compounds, is a ſuppoſition which no one has yet ſhewn to be at variance with fact. The two hypotheſes differ eſſentially; and in this very number, the Reviewer notices the Editor's objections to that of Dr. Girtanner, but inaccurately imputes to him the tranſlation of that author's papers.

From the ſtatement in the Review, it might be concluded that the Editor had adopted for his motto:

Oxygen eſt quodcunque vides, quocunque moveris.

How juſtly, let the following ſentences, from his earlieſt ſpeculations, bear witneſs: " Attention is undoubt-

" edly not leſs due to the other elements of organized " bodies ; and if the importance of oxygene ſeems to " have been magnified in the foregoing obſervations, it is " only becauſe we have few or no facts which afford a " foundation for reaſoning concerning the connection of " an exceſs or deficiency of hydrogene or azote, with " the functions of life." *Observations on Calculus*, p. 164.

The rear of this article is brought up by Dr. Ferriar's prediction, that " further trials" with airs, " will be undertaken, with hopes much reduced and " eagerneſs greatly allayed." It is not ſurpriſing that a writer who has ſo entirely entered into Dr. Ferriar's mode of thinking, and ſo exactly copied his ſtyle, ſhould ſo highly extol his writings, and ſo emphatically quote his authority. But, in truth, hope and eagerneſs—feelings varying in different individuals and at different moments in the ſame individual—are little to the purpoſe: and when it is deſigned to render diſappointment more glaring, to talk of high expectations is a ſtale rhetorical trick. In difficult reſearches, diligence, accuracy, and fertility in reſource, are the qualities requiſite. The Editor judges that apparent ſucceſs, even in a few caſes, is a better reaſon for proceeding with alacrity, than failure at firſt in a number of trials, for deſpondency, eſpecially as the modes of trial are ſuſceptible of ſo much variation. Let the impartial and the diſcerning decide which way of thinking is the more philoſophical.——

And now, courteous Stranger! thou who haſt audited this long account, if thou be ſatisfied, it is well—if thou be wiſer, thou haſt good luck—if thou have been entertained, it is full as much as the writer expected.

APPENDIX.

N°. I.

Remarks on the GASEOUS OXYD of AZOTE or of NITROGENE, and on the effects it produces when generated in the ſtomach, inhaled into the lungs, and applied to the ſkin:—

Being an attempt to aſcertain the true nature of CONTAGION, and to explain thereupon the phenomena of FEVER.

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THIS is the air mentioned by Prieſtley (ii. Exp. and Obſ. 54, &c.) under the title of *Dephlogiſticated Nitrous Air.* He diſcovered it by expoſing nitrous gas to iron, whereby that aeriform fluid was transformed in about two months to a ſpecies of gas of a very remarkable kind, "which keeps up combuſtion "naturally and freely in a candle immerſed in it, but "is at the ſame time highly noxious to animals, and "deſtroys their life the moment they are put into it;" whereas it commonly happens, that animals can live tolerably well in air ſo vitiated by inflammation, that a candle will no longer burn in it.

He obtained this air too by applying heat to a diſſolution of iron in nitrous acid, after the production of nitrous gas was finiſhed; in a direct proceſs by the diſſolution of zinc and tin in nitrous acid; by expoſing nitrous gas to a mixture of iron filings and ſulphur moiſtened with water, and to hepar ſulphuris; and likewiſe by iron and ſolution of copper in the nitrous acid.

He found, that when phlogiſticated air (nitrogene or azotic gas) and dephlogiſticated nitrous air (gaſeous oxyd of nitrogene or azote) were mixed together, it was an eaſy matter to ſeparate them by means of water; for the latter, by reaſon of its readier miſcibility with water, will combine with that fluid in a very pure form, while the former will remain unabſorbed.

Prieſtley's ſpeculations concerning the conſtitution of this air are attended with all the difficulty which beſets the doctrine of phlogiſton; and its true compoſition ſeems not to have been detected until ſince he wrote.

In the ſecond number of the *Recherches Phyſico Chymiques*, publiſhed at Amſterdam, an account is given, which confirms the facts related by Prieſtley. For this gaſeous oxyd was obtained by expoſing nitrous gas for three days over water to the action of wetted iron filings; by the ſubtraction of part of the oxygene of nitrous gas; by the moiſtened ſulphures of potaſh and ſoda; by the muriate of tin; and by ammoniac with a bit of copper in it: it is related alſo, that ſolutions of iron and tin in extremely diluted nitric acid, affords this gaſeous oxyd, and that the nitrate of ammoniac heated after mixture with three times its quantity of ſand, gives toward the end of the operation a large quantity of it.

One of the moſt happy diſcoveries of modern ſcience is that of the *principle of acidity or oxygene* being capacitated to afford products poſſeſſing very different qualities, by combining in greater or leſs proportion with the ſame radical. Thus, for example, azotic or nitrogene gas conſtitutes $\frac{73}{100}$th parts of our atmoſphere. Simple nitrogene, the baſe of this gas, is capable of combining with the principle of acidity as well as the matter of heat (caloric) in four diſtinct proportions. Azote, in its higheſt degree of oxygenation, forms *nitric acid;* in its next, it conſtitutes *nitrous acid;* in a lower, *nitrous gas;* and in the fourth or loweſt degree it affords the compound, now more particularly under conſideration, *the gaſeous oxyd of azote, or nitrogene.* We hence know with the utmoſt certainty that oxygene, or the baſe of reſpirable air, which compoſes the remaining $\frac{27}{100}$th parts of the atmoſphere, is in many proceſſes blended with azote in various quantities.

In the gaſeous oxyd, produced by the union of theſe two atmoſpheric ingredients, the portion of the acidifying principle combined with its nitrogene baſe is too ſmall to manifeſt the ſmalleſt degree of acidity; not even ſo much as to have any effect wrought upon it by expoſure to liquid cauſtic alkali, nor muriated tin; and in its pure ſtate undergoes no ſhrinking, decompoſition, or change, by mixture with the atmoſpheric fluid, nitrous gas, or vital air.

The properties of this oxyd are ſo ſingular and extraordinary, that Prieſtley affirms, (ii. 55.) at the time of his firſt publication on the ſubject, *he ſhould not have heſitated to pronounce them impoſſible;* to wit, a power at the ſame time of ſupporting flame, and of extinguiſhing life. This ſurpriſing quality is however doubtleſs owing to the difference in the attractive force which its oxygene exerts for hydrogene in the one caſe, and for carbone in the other; for it is known, that by mixing the gaſeous oxyd of nitrogene with carbonated hydrogene gas, the carbone is precipitated from its ſolution. Hence it appears, that the attraction for charcoal is much weaker than for hydrogene, and that although carbone may be made to burn in the gaſeous oxyd, hydrogene is the ſubſtance for which it has the cloſeſt affinity. And we can now readily conceive how the hydrogene of the candle may in an eſpecial manner contribute, by attracting the principle of acidity from the gaſeous oxyd, to keep up the inflammation, wherein ſome part of the charcoal may likewiſe, though in a ſecondary way, be converted to carbonic gas. It may be underſtood too, wherefore it is not capable of ſuſtaining life. There are two important purpoſes anſwered by animal reſpiration; the one to furniſh oxygene to the phoſphoric, ſulphureous and carbonic matter of the blood; the other to carry off its ſurpluſage of charcoal by means of the lungs. Now the gaſeous oxyd has leſs action upon phoſphorous and ſulphur than it has upon charcoal. Hence it is a very natural concluſion, that in ordinary breathing the gaſeous oxyd does not only not yield its principle of acidity to the blood in the pulmonic circulation, but at the ſame time does not ſufficiently attract carbone from the venous portion of it; whence it comes to paſs, that an animal inhaling an air, contributing to neither of theſe ſalubrious proceſſes, muſt ſpeedily die; its blood being both in a diſoxygenated and ſuper-carbonated ſtate: hydrogene alone being the ingredient in phlogiſtic operations which readily attracts its oxygene from the gaſeous oxyd.

The proportion of oxygene entering into gaſeous oxyd is $\frac{37}{100}$; the other 63 parts being nitrogene; whereas in nitrous gas, the oxygene conſtitutes 68 parts of the 100.

On reflecting upon theſe facts, it occurred to me this ſubject merited conſideration in ſeveral other points of view: as,

1. Since this remarkable aeriform product is afforded by a variety of artificial proceſſes, whether it is not generated likewiſe by a natural operation in the decay of organized bodies, containing both nitrogene and oxygene?

The hiſtory of nitre throws great light upon this query. That ſubſtance is known to conſiſt of nitrous acid joined to potaſh. It is uſually formed during the decay of animal and vegetable bodies, and by a ſpontaneous proceſs, is produced from their ruins. We are quite ſatisfied that azote and oxygene entered into the compoſition of thoſe bodies when alive, and have gone into new combinations on their diſengagement by death. One of theſe recent compounds muſt be nitrous acid, conſtituting by junction with a ſaline baſe, the nitrate of potaſh. Thus, the theory of the formation of ſalt-petre neceſſarily preſumes the generation of nitrous acid from two of the elements diſengaged from organic texture. And as azote, the radical of the acid, is eſpecially abundant in animal bodies, and as Lavoiſier (i. Traite elementaire de Chimie, 155) ſays, *favoriſe merveilleuſement la putrefaction*, wonderfully promotes putrefaction, there is little difficulty in conceiving, both how in ſuch circumſtances it attracts the acidifying principle, and afterwards attaches itſelf to the alkali.

But further than this, the authority of Mr. Becker (Notes to Bergman's Elective Attractions, 327) has been advanced in favour of the production of nitrous acid without the aid of the putrefactive fermentation at all. He found nitrous acid in the urine of cows, which had been eight days expoſed to the ſun. He mixed ſome of the ſoakings of a dunghill with a ley of burnt ſheep's dung and chalk in powder. The mixture began to ferment on the following day, and on the fourth, the internal commotion having ceaſed, he found at the bottom of the phial regular chryſtals of priſmatic nitre. He aſcribes the nitrous acid not to a proceſs going on in the air, but brought about by the *excretions of animals*. On examining the earth of ſtables and cow-houſes, he found its lixivium to yield priſmatic nitre, while that of the dung would afford only ſmall chryſtals, which required an addition of nitre in order to be reduced to a priſmatic form; and he declares he can attract ſalt-petre at pleaſure, in the courſe of three days, from the earth of ſtables and cow-houſes, by uſing for ſaturation well-purified pot-aſhes.

In the production of ſalt-petre, the putrified ſubſtance, if of the animal kind, affords little more than the nitrous acid. This was known to BOERHAAVE, who (i. Elementa Chemie, 44) ſays, the nitrous quality of the earth is derived from the excrements of animals and their putrified carcaſes, particularly ſuch as do not uſe ſea-ſalt, as birds, which, by the addition of the aſhes procured from the burning of plants and of quick-lime, forms ſalt-petre, &c.

This fact of the animal origin of the nitrous acid is confirmed by the teſtimony of MACQUER, (iii. Dictionaire de Chimie, 18) who declares, that in the putrefactive proceſs which affords nitrous acid, animal

mal ſubſtances have a decided preference ; ſo that, in order to make chryſtalizable ſalt-petre from ſubſtances purely animal, a quantity of the vegetable alkali muſt be added ; while the ſalt-petre produced in the putrefaction of vegetables alone is *naturally* found to be furniſhed with that quantity of fixed alkali which is neceſſary to form good nitre.

To this may be added the authority of FOURCROI, (ii. Lecon Elementaires, &c. 842) who ſpeaks of *acidity* as one of the early ſigns of animal putrefaction ; and of the proper putrid exhalation as not to be confounded with carbonic acid, (fixed air) hydrogene gas, (inflammable air) which are at the ſame time let looſe, nor with the phoſphoric emanation which ſometimes glows on the ſurface of corrupting animal ſolids. When to all this it is ſubjoined, that on analizing the ſoil taken from the bottoms of graves where human bodies have putrified, it has been found, though having no communication with the external air, to be highly charged with nitrous acid, the animal origin of this acid is put entirely out of doubt.

We hence ſee the reaſon why the French chemiſts have adviſed the uſe of wood aſhes to neutralize the redundant nitrous acid in their ſalt-petre works, and have even gone ſo far as to recommend foreign potaſh as greatly preferable. On this ſubject, the valuable paper of Mr. MASSEY may be conſulted in the Memoirs of the Mancheſter Society, where it is made to appear, that earths become impregnated with nitrous acid during the putrefaction of animal ſubſtances, but will not afford a cryſtal of nitre until the vegetable alkali is added.*

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* It is a pity, that notwithſtanding all theſe things, the French Academicians who framed the new Nomenclature, ſuffered themſelves to retain the words *nitrous* acid, *nitrous* gas, &c. which ſeem to me to be very improper, and to be quite as ſubject to objection as the terms *azote* and *nitrogene*, for their radical. The mind becomes unhappily impreſſed with the notion of thoſe products being derived from nitre.

In theſe ſeveral ways we find nitrous acid afforded by the putrefaction of animals themſelves, and by changes in their excretions. Now nitrous acid differing from the gaſeous oxyd barely in the degree of oxygenation, there is no difficulty in comprehending that if there was in any inſtance a ſpontaneous formation of the former, there would *(a fortiori)* be a more eaſy and frequent production of the latter.

And here it happens that the very thing which reaſon ſeeks for, nature affords. That particular gas, deſcribed by Mr. St. John (Preface to Method of Chemical Nomenclature, xi) as produced at certain times during the putrefaction of human bodies in diſſecting rooms, and as being a moſt active and dreadful poiſon, is in all probability the very aeriform product which is the ſubject of this memoir. That exhalation is not only incapable, in its concentrated condition, of ſuſtaining life, but, like the gaſeous oxyd, though it may be rendered leſs injurious by dilution, does not however change its original virulence in the leaſt, by the preſence of the atmoſpherical

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whereas the fact is, nitre derives its origin from this *animal acid*. Had I been a member of that committee of the academy, I ſhould have propoſed to derive the name of the radical from the Greek verb *σηπτω, putrefacio*; to call it *σηπτον, putridum*; and have made the Nomenclature ſtand thus:

1	2	3	4
Septon; inſtead of azote of nitrogene.	Septous gas; inſtead of azotic gas or nitrogene gas.	Gaſeous oxyd of ſepton; inſtead of gaſeous oxyd of azote or of nitrogene.	Septic gas; inſtead of nitrous gas.

5	6	7
Septous acid; inſtead of nitrous acid.	Septic acid; inſtead of nitric acid.	Septate; Septite, &c. &c.

and then the original of the thing being always ſuggeſted to the mind in the phraſeology, truth would have found a more ready reception, and no ſuch difficulty interpoſed as now beſets us, prepoſſeſſed as we are with the notion, that the nitrous is a *mineral* acid. For it ſhould be remembered, that although it is obtained from nitre, a ſalt claſſed among the mineral ſubſtances, yet it was produced by animal putrefaction before the nitre was formed.

rical fluids; and, like the gaſeous oxyd too, it is not remarkable for any fœtor or particular badneſs of ſmell; both of them differing entirely from the loathſome and nauſeous odour proceeding from dead bodies in a leſs dangerous ſtate of corruption.

The deleterious production, ſo particularly mentioned by Mr. Fourcroi, in his report on the removing the Cimiterie des Innocens at Paris, and now and then fatal to the grave-diggers, appears to be a gas of preciſely the ſame origin and qualities, and as in the former inſtance, is generated in the abdomen.

The gaſeous oxyd of nitrogene in theſe inſtances is always, as far as obſervation goes, of local origin, and ſeldom ſpreads very far in form ſufficiently condenſed to do miſchief. In large cities it is generally moſt abundant, by reaſon of the greater collection, along ſome of their ſtreets, ſewers, wharfs, docks, &c. of thoſe materials which afford it, and on account of the difficulty of ventilation in certain lanes, yards, and alleys, which allows the noxious vapour to ſettle there. In few inſtances that I have heard of, has it extended over a large tract of country; in the greater number of caſes it invades but a limited part of a large city, and that only, when a temperature of the weather, between 75 and 85° of Farenheit's ſcale, favours the formation of the oxyd.

When applied to a living body, freſh and ſtrong on its firſt formation, it produces violent inflammation and ulceration of the fingers or hand which come in contact with the body from which it proceeds; or drawn into the noſtrils, it excites alarming tumefaction, with heat and pain in the fauces and nares; or, if inſpired fully into the lungs, it brings on inſtant death.

2dly. If the firſt queſtion is ſatisfactorily decided in the affirmative, where large maſſes of animal and vegetable matter, in hot ſeaſons and confined places, undergo reſolution into their conſtituent parts, and form new combinations; then is it not preſumeable that gaſeous oxyd may be extricated from ſimilar materials by like cauſes, occaſionally, in the alimentary canal, or *primæ viæ* of human bodies while alive?

For the ſupport of animal life, it is neceſſary that ſupplies of food be, from time to time, received into the ſtomach. The ingredients of diet are of the animal and vegetable kinds, and conſequently contain all the materials, after their introduction into the body, that are proper to ſimilar ſubſtances out of the body. And were it not for the mixture with ſaliva, gaſtric liquor, pancreatic juice and gall, theſe alimentary matters would, from the operation of conſtant heat and moiſture undergo putrefactive alterations in the ſtomach and ſmall inteſtines. By the operation of theſe animal fluids, the nutritious part of the aliment is diſſolved, and prepared for undergoing the proceſs of animalization. For it is to be remarked, that no living thing in the perfectly healthy ſtate exiſts in the animal ſtomach; the deſtruction of life, even in oyſters, fiſhes, frogs, &c. ſwallowed entire, being a preparatory ſtep to their converſion into nutriment; and worms and other animals infeſting the guts, being enabled to live there only by poſſeſſing a conſtitution capable of counteracting the digeſtive proceſs.

Nobody has affirmed, that in the animal inteſtines the fluids are endued with animation, any more than the aliment they contain. Our reaſoning then concerning the whole contents of the firſt paſſages, cannot be governed by the laws which regulate animated ſyſtems, but muſt proceed according to the rules governing the decompoſition of organic bodies in ſuch circumſtances. Chemical inveſtigation here meddles not with living nerves and fibres, whoſe functions are not to be interpreted by its aid, but limits itſelf to the watching into what new forms the inanimate parts of plants and animals are changed after introduction into the belly; a ſubject on which it is certainly competent to decide. It has been conſidered, that in ordinary caſes, the ſolution of food in the gaſtric fluid regularly takes place, and the diſcovery has been acknowledged to be one of the happieſt which phyſiology has to boaſt of. Beyond this, our inquiries are very little ſatisfactory; and the inteſtines, though ſo eſſential to health, and ſo frequently the ſeat of diſeaſe, have, in the midſt of much curious reſearch, been ſtrangely overlooked. If, in conſideration of their containing inanimate ſubſtances prone to undergo the putrefactive proceſs, it can be ſhewn, that the cauſes uſually preventative thereof are, during certain ſeaſons, ſuſpended or weakened, then it will be evident that changes may take place within the inteſtines, correſpondent to thoſe which go on without them, and that ſimilar productions will flow from the one which are known to characterize the other.

Sydenham, (continual fever of the year 1661 and ſeq.) ſays, "he would give an emetic in the beginning of that fever, that the ſick might be preſerved "from thoſe dreadful ſymptoms that *ariſe from the* "*filth of thoſe humours that lurk in the ſtomach and* "*neighbouring parts, &c.*" and ſeems to have a good general idea of the noxious quality which the contents of the guts ſometimes poſſeſs. In his account too of the peſtilential fever and plague which raged in London in 1665 and 1666, he enumerates "violent vomitings, "a pain about the region of the heart, as if it were "oppreſſed, and a burning fever" among the earlieſt ſymptoms.

Huxham, (Eſſay on Fevers, chap. viii.) deſcribing the ſymptoms of the fevers which he terms putrid, malignant, and petechial, mentions, that together with "head-ach and giddineſs, *nauſea* and *vomiting* are "much more conſiderable than in the ſlow nervous "fever, *even from the very beginning.*"

In ſhort, in the collected opinions of thoſe phyſicians, whom Mr. Howard conſulted on the plague, as prevailing in the ſouth of Europe and in Aſia, (Account of Lazarettos) dryneſs of the tongue, *vomiting*, *hiccough*, *nauſea*, loſs of ſtrength, and fever, are enumerated among the *firſt* ſymptoms.

Indeed, the obſervation of any phyſician of much practice, in complaints of theſe kinds, as well as in the yellow fever, bilious fever, &c. is ſufficient in ſatisfying him, without recurring to written authorities,

ties, that the diſeaſed ſtate of the alimentry canal is not only one of the firſt group of ſymptoms that attract his notice, but is of the moſt troubleſome and dangerous nature too.

It has been doubted what could be the cauſe of ſo much diſturbance in the ſtomach and bowels. The diſorders incident to theſe are peculiar to animals, and are derived from the neceſſity we are under, becauſe of our locomotive faculty, of carrying a quantity of manure conſtantly within us; on which account our organization in this particular differs exceedingly from the vegetable creation, who have their food brought them, but are under no need of taking the crude maſs within them. If vegetables then have no analogous ailments, it muſt be owing to their inhaling their chyle from their external ſurface, and the inconvenience experienced by animals be referred to their taking into their bellies a good deal of matter beyond what is convertible to nouriſhment, and carrying the fœculent collection about with them. Our locomotive power is indeed a capital endowment; but the diſeaſes of the alimentary tube, with their endleſs train of ſymptoms and conſequences, are the immenſe price we pay for it. Upon this view of the comparative ſtructure of plants and animals, it would ſeem that we ſhould examine the kinds and qualities of food in the latter, in order to aſcertain the cauſes of thoſe complaints to which they are peculiarly ſubjected. And here it happens, we have a moſt ſtriking and inſtructive fact to guide us. Mr. Verdoni declares, that "the Greek Chriſtians in Smyrna, during the ſeaſon "in Lent, when they *eat only vegetables*, are very ſel-"dom attacked by the plague; while *among thoſe who* "*eat fleſh* the contagion makes great havock. Hence "the beſt means of prevention are to eat moderately, "and *not at all of animal food, &c.*" And I believe a multitude of facts tending toward the ſame concluſion could eaſily be collected.

The cauſe of plague, and conſequently of other analogous fevers, would ſeem to reſide then in the animal part of the ingeſta; and ſo, according to the theory, it ought; for from that ſource ſhould flow the azote, or baſe of the gaſeous oxyd, the cauſe of the moſt alarming and dangerous ſymptoms accompanying this claſs of diſtempers.

It is a fact worthy of particular regard, that the two caſes of contagion cauſed by the gaſeous oxyd, one produced from external cauſes, contaminating the air, and affecting the lungs and reſpiration, and the other ariſing from circumſtances exiſting within the body itſelf, and diſturbing the ſtomach and inteſtines, ſhould have been diſtinguiſhed by Hippocrates. In his book, *De flatibus*, he with great ſagacity, notes the "*aer*" operating without the body, and the "*ſpiritus*" acting within, and both of them cauſing fevers; to the former he aſcribes *epidemics*, where, from a change in the qualities of the air, many perſons are incommoded, as in peſtis; to the latter, he attributes *ſporadics*, where from bad diet flatulencies proceed, creating diſturbance in the whole animal frame.

There are four facts concerning the alimentary maſs which impreſs the mind with the belief of the actual extrication of the gaſeous oxyd in the primæ viæ. Firſt, The production of a gas is manifeſted by tenſion, oppreſſion, and belching, as unequivocal ſigns denoting wind, diſtending the bowels. Secondly, On ſome occaſions there is a vomiting of *black* matter, which conſiſts frequently of extravaſated blood; this tends to determine the gas to be of ſuch a ſort as to afford no oxygene to the blood, which therefore requires no floridity. Thirdly, The exiſtence of *green* ſtools, in certain ſtages of the diſeaſe, point with more certainty to this oxyd as their cauſe, particularly ſince it has been obſerved to tinge both water and glaſs of a remarkable green colour. And fourthly, There is no inſtance related of perſons afflicted primarily with this malady, except fleſh-eaters.

A ſource of poiſonous effluvia thus ſeems to exiſt in our own bodies, ſufficient to diſturb the animal machine exceſſively, and even to effect its deſtruction. There can hardly exiſt a doubt, that the great quantities of butcher's meat, poultry, and fiſh which we conſume, are the materials which chiefly afford the gaſeous oxyd, and that in our choiceſt viands we ſwallow down the principle of ſickneſs and decay. The fleſh of ſlaughtered animals, prone in hot weather to enter upon an incipient putrefaction, may in ſome caſes not meet with a ſufficient corrective in the ſtomach, and purſuing its propenſity there, may go on to rot and rot, and induce by its miſchievous productions the moſt calamitous conſequences.

It has been long ago doubted, by conſiderate and humane perſons, whether man was juſtifiable in preying upon his fellow animals. The authority of revelation, added to the make of his teeth, and the concluſions of reaſon, have decided in favour of his right. But how far this indulgence, or luxury, (for animal food can ſcarcely be called a neceſſary of life,) may be gratified, is left wholly undetermined. Our own experience alone, of the wholeſome or pernicious effects reſulting from its uſe, muſt guide us. Judging by this, there appears a phyſical certainty, that we devour more of it than does us good; nay, that in the enormous deſtruction of animal matter, raiſed in ſuch abundance for our riot and gluttony, ſome of the moſt ſerious of bodily evils are generated, and theſe particularly in cities, camps and ſhips, badly regulated. The cauſes of ſuch diſtempers are deeply founded in our ſtate of ſociety and way of life, and as long as we gorge ourſelves with animal food, and dwell among its putrefactive recrements, the poiſonous gaſeous oxyd of azote proceeding therefrom, muſt be expected to diſturb both our reſpiratory and digeſtive functions, and be followed by ſcenes of diſtreſs and woe.

3dly. Provided, the oxyd ſhould be produced during the diſorganization of the food, &c. in the alimentary canal, what changes will it bring about in the chylopoetic viſcera, and what ſymptoms excite in the conſtitution at large, particularly in thoſe who at the ſame time inhale more or leſs of it into the lungs?

No perſon acquainted with the mode in which the animal body acquires its heat in the lungs, need be informed that, in a caſe where the gaſeous oxyd has, in a dilute form, been breathed, and from the ſituation and circumſtances of the patient continues every moment to enter the trachea, the ſymptoms will be very different from thoſe of a perſon whoſe reſpiration is free from contagion, but has the noxious gas in his bowels merely. It is therefore to be carefully conſidered, that according to the nature and function of the organ on which the gaſeous oxyd exerciſes its virulence, will there be a variety in the morbid ſymptoms, though produced by the ſame cauſe. If, for inſtance, the ſtomach and the inteſtines are the ſeat of the gaſeous reſidence, inflammatory ſymptoms of thoſe parts, with tenſion of the præcordia, dryneſs and redneſs of the fauces, great heat and high pulſe may be expected to ſupervene;—whereas, if the lungs are pervaded by it, the heat will be moderate, the countenance pale, purple, or yellowiſh, the pulſe ſlow, and the firſt paſſages more quiet; while the moſt violent diſeaſe muſt enſue, when both the lungs and inteſtines are expoſed to its virulence.

1. Let its effects upon the ſtomach and bowels be attended to.

Coſtiveneſs is favourable to the production of this gaſeous oxyd, by retaining the fœces an inordinate length of time, and preventing the ready eſcape of the flatus. Accordingly, it is related, that in the bilious yellow fever of Philadelphia, which prevailed in 1793, (Ruſh's Account, &c. 52.) "the bowels "were generally coſtive, and in ſome patients as "obſtinately ſo as in the dry gripes; and flatulency "was an almoſt univerſal ſymptom in every ſtage of "the diſorder."

From its qualities, as mentioned before, we are at no loſs to explain the painful burning which ſometimes occurred before any vomiting took place, and the gaſtrodynia which at times uſhered in the diſeaſe. Nor, when we conſider the irritated or inflamed condition of the parts, can we be at a loſs to underſtand wherefore it ſeldom appeared without nauſea and vomiting, and why that vomiting was ſometimes ſo long continued, violent and convulſive.

The inflamed ſtate of the ſtomach and duodenum, and other parts of the inteſtinal tube, in all caſes of diſſection after death, and the black, gangrenous and mortified ſpots found thereabout in numerous inſtances, are juſt ſuch as might be expected from the operation of a gas ſo deleterious as the azotic oxyd, which in ſome caſes of high malignancy may be imagined to acquire by union with a larger portion of oxygene than common, an uncommon degree of activity, or *acrimony* as it is called; in its effects, reſembling in every particular that condition induced by the oxyd of arſenic.*

The coffee-coloured, grumous and dark matters ejected from the ſtomach, are probably in a great meaſure derived from the ſanguineous fluid, blackened by contact with the gas, and effuſed from the veſſels ruptured by its eroſion or cauſticity. Some part of them may conſiſt of bile vitiated by the ſame cauſe, and of putrid ichor proceeding from the gangrenous ſpots.

Excoriations of the rectum and external termination of it, correſpond to the inflamed ſtate of the ſuperior portions of the inteſtinal canal, and are fairly aſcribable to the ſame cauſe; as is alſo the hiccuping.

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* It is remarkable what an analogy there is between this oxyd of azote and metallic oxyds. Azote, as well as the metals, in its pure ſtate has little or no chemical operation upon the body: as ſoon, however, as they become oxydated, they acquire activity; and that this activity is proportioned to the quantity of oxygene they abſorb, is ſufficiently evinced by the preparations of antimony, arſenic and quickſilver. There is another trait of character in which azote reſembles arſenic and ſome other metals, which is, that they are both acidifiable baſes: as by increaſing the quantity of oxygene, you change the oxyd of the metal to an acid, poſſeſſing powers greatly ſuperior to what it poſſeſſed before, ſo, by giving the oxyd of the gas a larger doſe of the acidifying principle, you increaſe its activity to an extreme degree. There is thus a very ſtrong chemical analogy between the oxyd of azote, and white arſenic. Perhaps azote is a metal. Quickſilver is a metal, maintaining *fluidity* under the common circumſtances of terreſtrial heat and atmoſpherical preſſure. May not azote be a metal exiſting in the ſame circumſtances of warmth and weight in a *vaporific* form?

In a word, the pain in the ſides, and in the regions of the ſtomach, liver, and bowels, with their hotneſs and ſpaſms, and with the conſequent diſtreſs both of body and mind, all indicate the locality of this malady, as well as point to the nature and cauſe of it.

There is one caſe which may be imagined to happen, in which the ſtomach and bowels are diſturbed by the gaſeous oxyd ſwallowed with the ſpittle and the food. Where the oxyd is abundant, it can eaſily be underſtood from its diſpoſition to unite with water, that ſome part of it may attach itſelf to the fluids of the mouth, and be ſwallowed; as alſo forming a connection with the alimentary maſs in the act of chewing, may, together with it, deſcend into the ſtomach; and thus, in either caſe, produce its harmful effects.

2. Its operation upon the lungs ſhall be next inquired into.

If a full inſpiration of the gaſeous oxyd be made, there will be a ſudden extinction of life; and this accordingly accounts for the fact related by Ruſſel, (Hiſtory of Aleppo, p. 232.) and confirmed by other obſervers, of many perſons falling down dead ſuddenly, when ſtruck with the contagion of the plague.

If a quantity of the ſame fluid be mingled in ſuch proportion in the atmoſphere, as by its dilute ſtate to produce neither immediate death, nor catarrhal affections, then the ſlow and undermining effect of it, by conſtant breathing, will be manifeſted, firſt in the ſighing, anxiety, toſſing of the body; afterwards by langour, faintiſhneſs, coma; and afterwards by the ſleep-like and gentle approach of death.

An inhalation of a more condenſed or concentrated oxyd will account for the pulmonic ſymptoms ſometimes occurring, give riſe to pain and convulſions, and lead to an explanation why, after running a certain length, they ſhould ſuddenly end in effuſions of blood or other fluids to ſtop the reſpiration entirely.

I am ſatisfied, from experiments repeatedly made upon myſelf and others, that the heat of the body and beat of the heart and arteries are, to a certain degree, under the government of the will. This depends upon their connection with the reſpiratory organs. If, while all the other voluntary muſcles are at reſt, breathing be quickened by an effort of the will, the action of the heart and arteries will be increaſed, and ſo will the heat of the body; if, on the other hand, a perſon ſitting as quiet as poſſible in a chair, inſpires the ſmalleſt poſſible portion of air that he can, without bringing on anxiety, and continues to do ſo for ſome time, a thermometer placed in the arm-pit will fall ſeveral degrees, and the pulſations of the heart and arteries be exceedingly diminiſhed in frequency and force. I mention theſe experiments to ſhow how intimate the connection between reſpiration and the circulation of the blood is in the moſt healthy ſtate of the body, and how the latter is governed by the former. The heat of the body is nearly, other things being equal, in proportion to the oxygene gas decompounded in the lungs, and ſo alſo is the force of circulation from the ſtimulant quality imparted to the blood. If the air inſpired be mixed with a large quantity of non-reſpirable air, then, though a full inhalation be made, there will be but a ſmall portion of vital air decompounded, and, as in the caſe of voluntary diminution of the breathing, the heat muſt be leſſened, and the contractions of the heart be more ſlow and feeble. It can eaſily be underſtood then, wherefore in ſome caſes there ſhould be weakneſs of pulſe; in others, no uncommon quickneſs or frequency; in others again, ſuch lowneſs that it can be hardly felt. We hence are enabled to underſtand why the pulſe ſometimes intermits, and to account for that remarkable ſlowneſs, which, when conſidered in this point of view, indicates extremeſt danger; while, according to the ordinary way of judging, it has been conſidered as denoting that there was no fever: and the juſtneſs of this interpretation is confirmed by obſerving, on diſſection, the blood in the heart reſembling, in its qualities, the blood of perſons that have been hanged. The coolneſs of the ſkin and the coldneſs of the limbs are in this manner very naturally accounted for.

In certain caſes of high malignity, the bodies of patients dead of fever cauſed by this gaſeous oxyd, have been all over disfigured with purple ſpots, and have even ſometimes aſſumed a blackiſh hue. Yea, even during life, vibices and blackneſs are known to make their appearance, and when they do, to be attended with coldneſs prevailing in the livid parts a day or two before death. Theſe appearances are entirely explicable upon the idea, that the lungs are filled with a ſpecies of air, not capable of oxyganating the blood, carrying away its carbone, and imparting heat to the body. The caſe deſcribed by Huxham, in pages 98 and 99, is a very inſtructive one, and illuſtrates this doctrine in a forcible manner; as does the caſe deſcribed by Sandifort. (Obſ. Anatom. Pathol. 11.)

From a review and conſideration of the hiſtory of ſuch caſes, it would appear there was a *ſcorbutic habit* of body induced, and that the hæmorrhagies, debility, and proſtration of ſtrength, as well as the darkened colour of the blood, and the want of coheſion in the ſolids, might be all accounted for upon the ſame principle in fever as in ſcurvy.

It very ſoon occurred to me, if my idea was juſt, that the gaſeous oxyd ought, when in a concentrated form, and approaching the ſtate of an acid, to manifeſt itſelf by corroding metallic ſubſtances. On inquiry, I found facts of that kind on record; for Van Swieten relates, " that in the plague of Oczakow, the *ſilver* hilt of a ſword, which all the time " of the plague hung up in a tent, was changed " *quite black;* and the inſtruments which the ſurgeons " made uſe of were turned as *black* and *livid* as if " they had been dipped in *aqua fortis*," (nitrous acid.) (Comment. in Aphor. Boerhaav. §. 1407.)

Upon diſcovering this, I became convinced, that if my conjecture was right, a ſubſtance ſo active as the gaſeous oxyd ought, when applied to the ſkin of well perſons, to excite diſorder there, and this I found to be true: for Van Helmont (Tumulus Peſtis, p. 853.) ſaw a man, "who, upon touching "ſome papers infected by the plague, felt inſtantly "a pain like the prick of a needle; a peſtilential "carbuncle made its appearance ſoon after on his "fore finger, and he died in two days." A man who ſtirred up with his foot the ſtraw whereon the bed of a perſon ſick with the plague had been laid—"a little while after he felt an acute pain in "the lower part of his leg, juſt above the foot, as if "the part had been ſcalded with boiling water; the "next day the epidemis or ſcarf-ſkin was elevated "into a large bliſter, upon breaking which, a quantity "of blackiſh liquor ran out, and, underneath, a "latent peſtilential carbuncle was diſcovered, which "could hardly be cured in a fortnight." (Van Swieten, § 1409.)

There was another inference from my principle upon which I laid ſo much ſtreſs, that if it had not turned out according to my prediction, I ſhould have given up the whole matter as viſionary. This was the effect that air of the kind I had in contemplation ſhould have upon brute animals of the domeſtic kind. Thus *Sorbait* of Vienna (quoted by the laſt mentioned author) ſays, that during the plague, "*larks* ſo numerous "in Auſtria during the autumn, where "wholly wanting, ſo that not a ſingle one could be "met with; and *tame birds kept in cages all died.*" Homer mentions the death of *dogs* and *mules* as the forerunner of the peſtilence in the Grecian camp before Troy. (Iliad i. 69.) The pernicious and deadly effects of the atmoſphere during the plague at Athens, in the ſecond year of the Peloponneſian war, upon birds and beaſts, and particularly on dogs, is mentioned by Thucidydes* (B. ii.) Boccace, in his

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* The diſputes concerning Epidamnus and Corcyra had for ſome time agitated the governments of Corinth and Athens. Theſe diſſentions, founded chiefly in a jealouſy of the growing and encroaching power of the people of

his account of the plague at Florence, "ſaw with "his own eyes, *two hogs* that had rolled about with "their ſnouts, and gnawed ſome pieces of bread "which had been thrown from a poor man's houſe "who

Attica, furniſhed ſufficient pretexts for moſt of the ſtates of the great Peloponneſus, to join in a confederate war againſt them. In the 431ſt year before Chriſt, the war began between the Peloponneſians and Athenians, and their confederates on both ſides. That more vigorous preparation might be made for war, Pericles adviſed the Athenians to move from their country reſidences to their chief town Athens. His advice was followed. They ſent away their flocks and labouring cattle into Eubæa and the adjacent iſlands, tore down their houſes, and with their wives, children and furniture ſorrowly moved from the open country, where they had been accuſtomed to live, to their metropolis. Great inconveniences were now experienced by them, eſpecially ſince that, after repairing the waſte committed by the invaſion of Xerxes, the inhabitants had eſtabliſhed themſelves in a moſt comfortable way of living. After moving, they were obliged to adopt a new mode of life: few had houſes ready for their reception: ſome ſheltered themſelves with their friends and relations: the greater part were forced to ſettle in the leſs frequented quarters of the city, in the buildings ſacred to the gods and heroes: and many were even obliged to lodge themſelves within the turrets of the walls, or wherever they could find a vacant corner. In ſhort, there was a greater number of people than the city could contain, and after the *Pelaſgic* was occupied, the *Long-walls* and great part of the *Piræus* were portioned out to them for *little* dwellings. Thus pent up, the Athenians continued accumulating filth and noxious matter among them during the winter and until the enſuing ſummer, when, on the operation of heat, the gaſes were volatalized that brought on the memorable ſickneſs, which has been called the *plague of Athens*. The attempt of *Thucidydes* to trace it back to *Lybia*, *Egypt*, and *Æthiopia*, is wholly unſatisfactory, and juſt as groundleſs as our own endeavours at preſent to prove *yellow fever* always imported from the Weſt-Indies or ſome other foreign place. The cauſes of the plague at Athens, which was, in fact, only a very bad yellow fever, exiſted among themſelves, juſt as they do among the New-Yorkers and Philadelphians now-a-days. A truth ſo plain and ſo important as this is, ought to be candidly received by every citizen of the United States.

"who had died of the plague, inſtantly ſeized with "convulſions, and died within an hour after." In *dogs* and *cats* the ſymptoms of plague have actually been known to appear, ſhewing themſelves in the form of buboes, &c. The *cats* of Philadelphia died in 1793, and it is highly probable their deaths are to be in part aſcribed to the gas they breathed.

Again, if the idea I entertained was well founded, the gaſeous oxyd ought, when very concentrated, to ſhew its capability to ſupport flame. The two following facts, though not related with ſufficient accuracy or diſtinctneſs, are however caſes in point, and as far as they go, illuſtrate and confirm the doctrine in a forcible manner. The firſt is "that a lighted candle "being held near dying perſons, a very *livid* vapour "was ſeen to iſſue from their mouths." The other, the relator ſays, he frequently obſerved in the form of a *blue* ſmoke, as it were, in the rooms where the infected lay. (Van Swieten, § 1407.) Now, when theſe facts are compared with what Prieſtley deſcribes of a candle burning in the gaſeous oxyd with an enlarged flame, by another flame (extending every where to an equal diſtance from that of the candle, and often plainly diſtinguiſhable from it) adhering to it, and in ſome of his experiments burning *blue*, there appears to be conſiderable ſimilarity in the caſes.

Moreover, knowing that under an atmoſpherical preſſure, which ſupports the quickſilver in the barometer at 29.84 inches, and in a temperature of 54.5 of Farenheit's ſcale, a cubic foot of azotic gas weighed one ounce thirty grains and one half; and of oxygenous gas, one ounce one dram and fifty-one grains: it was preſumable that a combination of the two, that is, thirty-ſeven parts of oxygene united with ſixty-three of azote, would form a fluid of nearly the ſame weight with atmoſpherical air, or rather heavier, and the probability of this would increaſe, by conſidering that a cubic foot of nitrous gas, which contains only thirty-one parts more of oxygene than the gaſeous oxyd does, weighs one ounce two drams and thirty-nine grains. An inference from this is, that perſons who reſide in low ſituations, where the gaſeous oxyd is generated, or patients who lie near the floors of infected chambers, ought to ſuffer more than others, by reaſon of their breathing an atmoſphere more loaded with non-reſpirable vapour, tending downward on account of its weight. This inference from the principle is alſo conformable to fact, ſince it is known both in New-York and Philadelphia, the lower parts of the city have been moſt ſeverely afflicted, and that phyſicians, friends, nurſes, &c. who walk erect in the chambers of the decumbent ſick, eſcape danger, and breathe a tolerably pure air; while the unhappy patient, lying near the floor, toward which the heavier oxyd ſettles, inhales deadly gas at every inſpiration.

Again, it was clear to me from the little diſpoſition the gaſeous oxyd poſſeſſes to combine with other bodies, and from its conſiderable weight, that it might be tranſported from place to place, in tight boxes or packages of goods, &c. and that on opening theſe, and taking out their contents, the unchanged gas might be inſpired into the lungs, or inſinuate itſelf into the ſtomachs of ſuch perſons as ſhould be expoſed to it. This inference from the principle is alſo conformable to fact; for upon it depend the inſtantaneous deaths in ſome caſes; tranſported infection in others; and fevers kindled up in others, from the ſubtil matter exhaling from ſuch fomes.

Beſides, if, from the heavineſs of the oxyd, it always has a tendency to the lower parts, then ſhips, through whoſe ſides it cannot leak out by reaſon of their tightneſs, ſhould be very apt to accumulate it; and this too correſponds with the fact; ſea-veſſels being among the chief agents in its production and diffuſion, the receptacles of its collected virulence, and the ſeats of its moſt deſtructive ravages. Cellars are noxious for the ſame reaſon.

It muſt be obvious, that the ſymptoms of theſe febrile diſeaſes, excited by the gaſeous oxyd, are diviſible into two claſſes. Sporadic caſes may occur, in which, from its production within the body, the ſtomach and bowels may chiefly labour, and in theſe will the ſymptoms firſt enumerated prevail, attended with high excitement of the ſyſtem. Endemic ſickneſs may generally be expected, when, from an extrication of the gas in large quantity from ſome abundant ſource without the body, the contagion operates upon the lungs, and produces the ſecond claſs of ſymptoms, and in theſe will the pulſe be ſlow, and the heat moderate. The worſt caſes that can occur will be thoſe, where, both from external and internal cauſes, the ſtomach and lungs and ſkin are attacked at once, and afford a mingled aſſemblage of ſymptoms.

There has been much diſpute about the production of contagion, whether from animal or vegetable matter. The controverſy ſeems to me to be a trifling one. It is underſtood from analyſis, that the bodies both of plants and animals are compoſed of the ſame elements or principles, varying in their proportions, ſtructure, &c. It is known, for inſtance, that oxygene, which conſtitutes $\frac{37}{100}$th parts of the azotic oxyd, is very plentiful in moſt vegetable ſubſtances, and that ſome of them alſo contain a portion of azote, the ingredient forming the other $\frac{63}{100}$th parts. In ſuch caſes there can be no queſtion, that the oxyd might be produced during their decompoſition. It is likewiſe known, that animals contain a very great proportion of azote, and moſtly a moderate quantity of oxygene. There can be hardly a queſtion then, that the oxyd might be generated from decaying ſubſtances of this ſort. But as the one ſubſtance is highly charged with oxygene, and the other with azote, the mixture of the two ſeems moſt likely to afford the greateſt amount of oxyd, and this, I believe, is agreeable to fact. Pure animal matter will therefore perhaps be leſs likely to afford this oxyd than a mixture of it with vegetable. This explains why the ſtomachs of living perſons, containing commonly a mixture of the two kinds of food, and the abdomen of dead bodies are ſo prone to the production of it; and why ſlaughter-houſes, tan-vats, currying-houſes, works for making glue and Pruſſian blue, the horner's buſineſs, oil-ſhops, and manufactories of ſoap and candles are not remarkable for generating contagion. There is very little aceſcent vegetable matter employed there, and conſequently the gaſeous oxyd is ſparingly formed. On the other hand, in vinegar-cellars, wine-preſſes, cyder-mills, and other places where much unmixed vegetable matter of the oxygenous kind is accumulated, no inconvenience ariſes, as there is little azote to join in producing the oxyd. I ſee, however, no improbability in the idea, that independent of animal and vegetable matter at all, there may exiſt in nature ſome mode of combining oxygenous and azotic airs. But I know of no ſuch proceſs at preſent.

This inquiry has brought contagion home to our doors, and traced it to its ſeat within our bodies. Henceforth much of the labour employed in tracing the origin of fevers in foreign places, and their introduction in ſhips to our own ports, may be conſidered as ſuperfluous.

Cauſes enough exiſt among ourſelves, at certain times, to engender the moſt noxious vapours. The ſtudy of the production, and diffuſion of theſe from domeſtic and internal ſources ſhould moſt aſſiduouſly engage our attention. In doing this, we ſhall be employed in earneſt, in counteracting as well as detecting this wide-ſpreading and terrible evil.

On this head I ſhall firſt ſpeak of prevention, as it reſpects the ſtomach and inteſtines.

According to the theory delivered, the perſons who live on vegetable food, or keep a lax belly, ought to have no diſorder, or a very ſlight one. This concluſion is confirmed by facts in abundance. The advice given by the Arabian phyſicians to prevent the plague, enjoins the repeated uſe of acid fruits, as pomgranates, Seville oranges, lemons, tart apples, &c. but above all wine-vinegar in ſmall quantities, &c. (Mead on the Plague, chap. ii.) Doctor Wade has eſtabliſhed the efficacy of a vegetable diet, (Ruſh on Yellow Fever, 334.) and of water as a drink, as the beſt means of preventing the yellow fever in a hot climate. Mr. Howard has borne teſtimony of the benefit of low diet as a preventative of the plague; and it is reported, that during the famous plague deſcribed by Thucidydes at Athens, Socrates the philoſopher preſerved his life by means of ſlender diet, as did Juſtinian at Conſtantinople in a ſimilar caſe, by his abſtinent way of living. The avoiding of animal food, adhering to a low diet, and taking laxatives, was doubtleſs one of the means of preſerving the life of Dr. Ruſh, during the late calamity in Philadelphia; and what may ſerve as a hoſt of facts, in a word, it is related by Bontius, that the plague has never yet ſhewn itſelf among the natives (rice-eaters) of the Eaſt-Indies. Speaking of China, Dr. Mead ſays, "We have no inſtance of the plague that was originally bred in that country."

Here then, we have evidence of ſuch an extenſive and concluſive kind, as to ſatisfy even the ſceptical mind concerning the eaſe and poſſibility of prevention. By avoiding animal food azote is kept out of the ſtomach, the deſtructive gaſeous oxyd is not formed, nor are the inflammatory torments of the bowels felt. By keeping an open belly, the plan of ſecuring the health will be promoted, and no detention of feculent matter give riſe to flatulency and oppreſſion. I doubt whether the metallic rod will more ſecurely guard us from lightning, than vegetable food preſerve us from peſtilence.

As to the ſecond head of prevention, as it regards the production of the gaſeous oxyd in quantity ſufficient to contaminate the air and injure the thoracic viſcera, it forms ſo intereſting a branch of general police that it is needleſs to remark any further upon it than to ſay, while puddles of putrid naſtineſs, and piles of reeking dung are inceſſantly exhaling their poiſonous ſteams, that magiſtracy conſults very imperfectly the public health, which neglects the removal of ſuch common nuiſances. The city, as well as the individual citizen, wants a cathartic now and then; and by this plan, and by changing animal for vegetable food in the ſummer time, a world of ſickneſs and mortality might be prevented.

In the caſe of gas already produced, and pervading the rooms of a houſe, or the houſes of a neighbourhood,

hood, as it is formed by a chemical proceſs, it may be very rationally demanded, whether by ſome chemical operation the gaſeous oxyd may not be decompounded? It has been already ſtated in the hiſtory of the ſubſtance, that it reſiſted decompoſition by ſulphur, phoſphorus, and cauſtic alkali entirely; was but feebly attracted by charcoal; and that hydrogene was the only ſubſtance as yet known, having a powerful affinity to it. In what form this can be applied ſo as to ſeparate the oxygene from the oxyd, and leave the naked azotic gas in the poſſeſſion of its ordinary harmleſs qualities, is a field for curious and uſeful inquiry.

Long ago has it been remarked, that our vices were the parents of our misfortune. Never perhaps was ſentiment more ſorrowfully verified than in the preſent inſtance. Our luxury and feſtivity doom the inhabitants of air, earth, and water to death; and it ſeems as if, in revenge for our cruelty, this tormenting ſpirit had ariſen from their graves to plague us.

HITHERTO we have been ignorant of the preciſe nature of contagion; but ſince we are become acquainted with its production and compoſition, it is very much in the power of individuals to guard themſelves againſt it, and for magiſtrates to protect cities from its ravages. To what extent the principle now ſtarted may be carried in explaining other diſeaſes, is not eaſy to imagine. One can hardly ſuppreſs the conjecture, that the ſame poiſon which in a coſtive habit of body cauſes inflammation of the ſtomach and dreadful fevers, will in a lax habit occaſion cholera or diarrhœa, or in caſe the large inteſtines be obſtructed, terminate in dyſentery. How far it may, when operating on the lungs, concur in producing influenza and ſcarlatina, is an intereſting queſtion. And this is particularly worthy of our notice, from the reaſon and analogy of the thing, independent of the very remarkable and impreſſive fact related by the elegant and judicious author of the account of the yellow fever in Philadelphia in 1793, who tells us, (p. 6.) that cholera, remitting fevers, dyſentery, influenza,

fluenza and ſcarlatina were the immediate forerunners of the diſorder he deſcribes; and that "in the courſe "of a few weeks (p. 89) they all diſappeared, or ap-"peared with ſymptoms of the yellow fever; ſo that "after the firſt week in September it was the ſolitary "epidemic of the city." The caſe of the girl immediately following this quotation proves the propoſition I am contending for to a demonſtration. There is reaſonable ſubject of inquiry too, how far in phthiſis in hot climates, and ſcrophula, may be derived from a like ſource.

The connection of this fever with other complaints is ſtrikingly exemplified in the following narrative: (Anſon's voyage, fol. p. 131.) But (ſpeaking of ſcurvy) ſays Mr. Walter, "it is not eaſy to complete the "long roll of the various concomitants of this diſeaſe; "for it often produced putrid fevers, pleuriſies, the "jaundice, and violent rheumatic pains, and ſome-"times it occaſioned an obſtinate coſtiveneſs, which "was generally attended with a difficulty of breath-"ing, &c. &c. At other times the whole body, but "more eſpecially the legs, were ſubject to ulcers of "the worſt kind, &c. &c." The evidence of analogy, too, ſtrongly favours the opinion, that other contagions and poiſons may conſiſt of the ſame materials, varying but in their proportions, or in ſome unimportant circumſtance, and that the virus of ſyphilis, ſmall-pox, and meaſles, and of the ſpider, rattle-ſnake, and other venomous creatures, as being all of animal production, may conſiſt in the main of azote and oxygene, combined perhaps with ſome other ingredient; and there is high probability that marſh miaſmata will be found little elſe than a ſimilar compound. The ichor of cancer and other corroding ulcers is very probable pretty much the ſame thing. The diſeaſe of rabid animals, and the dread of water, and other miſerable ſymptoms conſequent upon their bites, may very probably receive ſome light from this ſource; and ſo perhaps may ſibbens, yaws, and leproſy.

We have conſidered already what varied ſymptoms may be cauſed by the ſame matter operating upon

different

different parts of the animal frame. In all probability much of the difference obſervable in the operation of different poiſons, ariſe from the ſenſibility, irritability, ſtructure, and function of the part to which it is applied. This idea at leaſt ſeems to be countenanced by what we obſerve in the ſyphilitic virus, which, when applied to a ſecreting ſurface, cauſes gonorrhœa; to a dry one, chancre; to a glandular ſurface, bubo, &c. Who knows but a ſimilar exciting cauſe may, by operating upon the conſtitution, in one way produce continued, in another remittent, and in a third, intermittent fevers, which in reality differ from each other leſs in their cauſes than in the particular part of the body to which this cauſe is applied? The difference of the ſeveral fevers brought on by this gaſeous oxyd being chiefly connected with the viſcus or function injured by its action, it is to be underſtood, that if the liver is invaded, this may induce according to circumſtances an impeded ſecretion of bile, and then there will be a fever without yellowneſs, or an obſtruction of the gall-ducts, when, from an abſorption from the ſecreted fluid, there will be yellowneſs tinging the eyes or ſkin, or a vitiated ſecretion, appearing in the form of a green or brown matter vomited up. In like manner, when the lymphatic ſyſtem is the ſeat of its action, it may cauſe buboes in the glands; or when the ſkin is beſet by it, carbuncles, ſores, and miliary and petechial eruptions may break out. So likewiſe in the mouth and fauces aphthous ulcers, and eryſipelatous inflammation, a ſpreading perhaps of the original malady in the ſtomach, may all derive their origin from the ſame cauſe.

This method of conſidering contagions is entirely conformable to the ſimplicity of nature. The aſſignment of a multiplicity of cauſes, to account for particular phenomena, always betokens a backward ſtate of knowledge. The buſineſs of ſcience is to generalize facts, to claſs phenomena under diſtinct heads, and ſhow their dependance upon a common principle or cauſe. Accordingly, in the progreſs of human reaſon, polytheiſm has yielded to the conviction of the exiſtence of *one* God; the intricate and ſeemingly oppoſite phenomena of matter and motion have been referred to one general law of gravitation; the puzzling and diverſified appearances of electricity have been reduced to a few plain rules; the multitude of facts concerning light and colours have been in like manner arranged into a ſcientific form; and both the *rainbow* and the *teleſcope* bear witneſs to the ſimplicity of optics. The fluids compoſing our atmoſphere have been analized, and the influence of theſe, and of many occaſional combinations of other ſubſtances into gaſes, upon life and health been inveſtigated to their principles. Contagion alone has remained a ſubject for doubting and gueſſing; a diſmal ſomewhat, whoſe exact origin was unknown, and whoſe operation ſeemed capricious or unaccountable. This, I truſt, will now, like other agents in creation, be found to have its laws of production, diffuſion, and action, which are ſteady and unvaried in their nature, as well as ſimple and eaſy to be comprehended.

I was going into the practical conſiderations and directions reſulting from the principles laid down; but the ſubject was ſo extenſive, and materials flowed in upon me ſo faſt, that the work would very ſpeedily have extended far beyond the bounds I had now preſcribed to myſelf; and impreſſed as I was with the extenſive and beneficial application of this doctrine of contagion to every place upon earth where it is generated, and to every conſtitution upon which it acts, I felt a deep concern to make it public as ſoon as I conveniently could.

APPENDIX.

Nº. II.

On the uſe of the NITRIC ACID in Medicine, by Mr. W. SCOTT, Surgeon in ſervice of the Hon. Eaſt-India Company, Bombay.

The following attempt to extend a little the limits of the Healing Art, is inſcribed as a tribute of reſpect to the character of Doctor James Anderſon, Phyſician General of Madras.

IN Auguſt 1793, I employed myſelf for ſome time in making experiments on the bile, a ſecretion that is connected in a great degree with many of the diſeaſes of this country. I wiſhed to unite ſome of the calces of mercury, with the reſinous matter of that fluid, for I imagined that I might diſcover ſome chemical affinity between thoſe ſubſtances, and be able to ſee by what means this metal is ſo ſingularly qualified for removing obſtructions * of the liver.

I had collected for experiment a quantity of the reſinous baſe of the bile of a buffalo, which I had ſeparated very carefully from its ſoda, and from the lymphatic matter with which it is united. I had put a drachm or more of this ſubſtance into a veſſel, to which I added about half of the ſame weight of the red calx of mercury, with ten or twelve ounces of water. On heating the whole together, I was ſurpriſed to obſerve that the baſe of the bile became remarkably more ſoluble in the water. I cannot ſay that

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* I have uſed the word obſtruction to expreſs the chronic diſeaſe of the liver ſo common in this country.

that I obſerved the red colour of the calx in any great degree altered, but it is known to retain its brilliancy with different quantities of oxygene†. I filtrated this bitter ſolution which depoſited the baſe of the bile, as the water evaporated in the ordinary heat of the atmoſphere. I ſhall at another time conſider this ſubject with a little more attention.

M. Fourcroy has obſerved, that water diſſolves a ſmall portion of the baſe of the bile. In this experiment a conſiderably larger quantity was taken up than water could have diſſolved, which I attributed to the oxygenation of the reſin, by the pure air of the calx. I had ſome reaſon to think, that obſtructions of the liver do often conſiſt of a depoſition of the reſin of the bile, which I now began to ſuppoſe, might be rendered ſoluble in the animal fluids, by the pure air of the mercurial preparations that are given for the diſeaſe. I have ſeen livers on the diſſection of the dead, of a pearl colour, and much enlarged, which I ſuſpect were compoſed in a good meaſure, of this reſinous matter. I have even found it from accurate trials in a conſiderable quantity in the ſubſtance of a liver, that was apparently without diſeaſe: Is the well known effect of new graſs, in diſſolving the biliary calculi of the gall bladder, that cattle get in the winter time, to be accounted for from the pure air of green and aceſcent vegetables?

It is acknowledged, that all the calces of Mercury which are uſed in medicine, contain a quantity of pure air, but I know of no direct experiment having been hitherto made, to prove that the effect of mercury in diſeaſes of the liver or in other maladies depends on this principle, and not on the metal itſelf. The experiments that I had made on the baſe of the bile, inclined me to wiſh, to take myſelf a quantity of pure air united to ſome ſubſtance, for which it has no great attraction. I reflected on the different ways that are employed by chemiſts to oxygenate inanimate matter; for I believed, that the ſame chemical attractions would produce a ſimilar effect in the living body, although they might be diſturbed in their operation, by the vitality of the machine, and the variety of the principles of which it is compoſed.

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† See experiments by Van Mons on the red oxide of mercury.

The nitric acid as may be ſuppoſed, was one of the firſt ſubſtances that occurred to me as fit for my purpoſe, for it is known to contain about four parts of vital air, united to one of azote, with a certain proportion of water. Theſe principles can be ſeparated from each other, by the intervention of many other bodies, as chemiſts find every day in their operations. I was led beſides to give a preference to the nitric acid from obſerving, that it diſſolves very completely the reſinous baſe of the bile: I have ſince found that the celebrated M. Fourcroy had made the ſame obſervation before me.

Before I began to take the nitric acid, I conſulted all the accounts of it that I could procure, with the view of learning ſomething of its effects on the human body. The reſult of this inquiry was but little ſatisfactory, for I only found that it had been given as a diuretic in very inſignificant quantities, or recommended in general terms, where the mineral acids are ſuppoſed to be uſeful; I did not think myſelf warranted to adminiſter it to others from ſuch imperfect information, but I reſolved to take it myſelf, and I thought I was particularly qualified to determine its effects, as I had reaſon for a long time before to complain of my liver.

In September 1793, I began to take the nitric acid: I mixed about a drachm of the ſtrongeſt that I could procure, with a ſufficient quantity of water, and I was happy to find, that I could finiſh that quantity in the courſe of a few hours, without any diſagreeable effect from it. The following is the Journal that I kept of myſelf at the time.

11*th September*, 1*ſt Day*.—Took at different times about a drachm of ſtrong nitric acid diluted with water. Soon after drinking it, I feel a ſenſe of warmth in my ſtomach and cheſt, but I find no diſagreeable ſenſation from it, nor any other material effect.

2d.—I have taken to-day a conſiderable quantity of acid, diluted with water, as much as I could eaſily drink during the forenoon.

3d.—I have continued the Acid: I feel my gums affected from it, and they are ſomewhat red and enlarged between the Teeth. I ſlept ill, but could lie for a length of time on my left ſide, which from ſome diſeaſe in my liver, has not been the caſe for many months before. I perceive a pain in the back of my head, reſembling what I have commonly felt when taking mercury.

4th.—My gums are a little tender: I continue the acid as before. I ſtill find a pain in my head and about my jaws, like what ariſes from mercury. I perceive no ſymptoms of my liver complaint.

5th.—I have taken the acid, and always feel an agreeable ſenſe of heat after drinking it. I ſpit more than uſual.

6th.—I continue the acid: I obſerve my mouth ſorer to-day, and ſpit more.

7th.—I think I am now ſufficiently oxygenated. I feel my mouth ſo troubleſome, that I ſhall take no more acid.

From this time my mouth got gradually well, and I found my health conſiderably improved.

I now began to ſuppoſe that I had diſcovered a remedy for that chronic diſeaſe of the liver, which is ſo much more common here than the acute hepatitis. I thought that it might in ſome reſpect be preferable to mercury, as it did not appear to produce the inconveniences that ariſe from the uſe of that metal. I have given it ſince to a number of people who had taken mercury for hepatic obſtructions, without being effectually cured, and I have found it in many caſes produce the moſt agreeable conſequences. If it were proper on this occaſion to be more particular in detailing the caſes, in which I have adminiſtred this remedy, I believe that I could make it very probable that I have not been deceiving myſelf. In the acute hepatitis I have hardly employed it, for where the life of a perſon is in immediate danger, I have thought it my duty to make uſe of remedies that are eſtabliſhed.

I have with the beſt effect oxygenated ſeveral people with the nitric acid, who were much reduced by tedious intermittents. That kind of fever is often connected with a diſeaſed liver or ſpleen. In conſequence I think of this remedy, I have ſeen them recover their natural colour from a leaden or bilious hue, and regain their ſtrength from a ſtate of long continued weakneſs. I believe, if given in a ſufficient quantity, it would be very uſeful in the fever of this country, which has been called bilious, or nervous or putrid, and for which mercury appears to be a ſpecific.

I have met with two inſtances only in this country of diabetes:—They were both natives and in the decline of life; I cured them both by mercury, after many other remedies had been tried:—One of thoſe men had a relapſe of his diſeaſe, which I removed a ſecond time with the nitric acid. I thought this a ſatisfactory correſpondence in the effects of the two remedies—May they not both be uſeful in that diſeaſe?

The great reſemblance that I perceived in myſelf between the effects of mercury and of the nitric acid, made me anxious to know if the acid would remove the various ſymptoms of ſiphylis. In September 1793, it was adminiſtred at my deſire by my friend Mr. Anderſon, Surgeon of the 77th Regiment, to a perſon who had a head-ach that came on every night, and which had long been ſuſpected to ariſe from lues. He had taken ſeveral courſes of mercury on this account, which carried away all the uneaſy ſymptoms, but they as conſtantly returned after a certain period. On uſing the acid for about a fortnight, he got perfectly free from his head-ach, and he remained very well for a few months, as was uſual to him after mercury.

I have now had a pretty extenſive experience of the good effects of the nitric acid in ſiphylis, and I have reaſon to believe, that it is not in general leſs effectual than mercury, in removing that diſeaſe in all its forms, and in every ſtage of its continuance.

I think that in ſome caſes, it has even ſuperior powers, for I have ſucceeded completely with the acid, when mercury adminiſtred both in this country and in Europe for years together, had failed of ſucceſs. We appear to be able to carry the degree of oxygenation of the body to a greater length by means of the nitric acid, and to continue it longer than we can do by mercury.

A maſs of mercury in the circulation produces many diſagreeable effects, that make it often neceſſary to give over its uſe before it has anſwered it's intention; but the nitric acid may be taken a long time without any material injury to the health, nor are its effects on the mouth in producing inflammation and a flow of ſaliva ſo diſagreeable as from mercury.

A man could hardly offer to his ſpecies a greater bleſſing than a new remedy againſt any of the hoſt of diſeaſes that aſſail us, but the reputation of ſpecifics with the exception of a few inſtances, has ariſen only from the weakneſs of the human mind. Am I too deceiving myſelf, and attempting to lead others into error?

As the acid that I diſtil is not ſtrong, and is of unequal ſtrength at different times, I am regulated chiefly by the taſte in giving it. I put half or three fourths of a Maderia-glaſs full of it in two pints of water, or I make two pints of water as acid as it can well be drank. This quantity is finiſhed every twenty-four hours, taking about a Maderia-glaſs full only at a time.

I have ſometimes removed ſiphylitic ſymptoms with the acid in five days; more commonly I think, they give way in a fortnight; but ſometimes, though ſeldom, they continue for twenty days without any apparent relief. I muſt confeſs, that in ſome caſes I have failed altogether, but in thoſe caſes mercury had long been given to little purpoſe, the bones were highly diſeaſed and the habit probably of a peculiar kind. I have cured ſiphylis with the acid under a variety of forms, where no other remedy had ever been employed, and for above two years I have ſeen no relapſe in thoſe caſes. I have adminiſtred it againſt the primary ſymptoms of the diſeaſe, and I have given it for exoſtoſes, for carious bones, for nocturnal pains, for eruptions and ulcers of the ſkin, and for all the train of miſery that is attendant on lues. I have the pleaſure to ſee that ſeveral of my friends have begun to uſe the nitric acid in ſiphylis and in other diſeaſes: An account of their experience which every body will eſteem the moſt reſpectable authority, will make the ſubject of a future paper.

I hope this ſlight account will induce medical practitioners to try the effect of the nitric acid in ſiphylis, a diſeaſe which in this climate is ſo frequently the diſgrace of their art—Too often the miſerable wretch is but worn down the ſooner by the very remedies that are called in for his relief.

> Quaeſitæque nocent artes; ceſſere Magiſtri,
> Phillyrides Chiron, Amythaoniuſque Melampus.
>
> Virg: Georg. III.

APPENDIX.

N° III.

Caſe of diſeaſed Bladder, by Mr. BAYNTON, Surgeon, Briſtol.

Dear Sir,

AS the ſucceſs that attended the treatment of the following diſeaſe may be referred to a hint offered in your Treatiſe on Sea Scurvy, Calculus Conſumption, &c. I take the liberty of ſending you its hiſtory.

On the 14th of September, 1794, in the evening, I was requeſted to meet a Mr. Lawrence who at that time practiced as a Surgeon and Apothecary in the environs of this city, to *inveſtigate* the caſe of a perſon of very robuſt make and about thirty years of age, who had applied to him a few weeks before for the cure of a Gonorrhæa which he informed me he had treated in the uſual way, with injections &c. but that diſtreſſing ſymptoms had been daily increaſing and for ſome days had been nearly as violent as they then were. He complained of a very ſevere pain and tenderneſs to the touch about the region of the pubis and along the perineum, and paſſed his urine with great pain and difficulty by drops, and with it a large quantity of peculiarly viſcid mucus that was ſometimes tranſparent, at others bloody, but always ſo viſcid that it was with difficulty waſhed from the ſides of the veſſel in which it was received. His pulſe were remarkably hard and full and beat 110 ſtrokes in a minute. He had conſtant teneſmus and had not ſlept for many nights, by my deſire he was bled to the amount of 14 ounces. Twelve leeches were applied upon the hypogaſtrium and about the verge of the anus. He had an opening medicine and the following anodyne as ſoon as the opening medicine operated:

℞ Tinct: Opii: gutt: xL Vin: Antim: gutt: xxx Syr: Papav: Albi: Drachm. i. Dec. Hord: comp: Unc: 1ſs.

On the morning of the 15th he was in no reſpect better; the opiate failed to give eaſe. The pain of diſcharging urine and the teneſmus were equally violent, and nearly half a pound of mucus had been diſcharged from the bladder in the courſe of the night. The draught was repeated with the addition of 10 drops of the Tinct. Opii. and the abdomen was directed to be well fomented with flannels, wrung out in a decoction of poppy heads, every fourth hour. In the evening we found him nearly in the ſame ſtate, except that the mucus diſcharged appeared to increaſe. An injection of the Dec. Amyli. with Tinct. Opii. was now directed to be thrown up the rectum in the hope of procuring him ſome eaſe; but it failed to afford even temporary relief, and he evidently became worſe every day. On the 18th he was directed to take half a drachm of the Pulv. Uvæ Urſi. three times a day, in a draught of the compound decoction of barley. The opiate was continued, and various other remedies, as bark, balſam of copaiva, &c. were exhibited with no advantage, until the 28th, when his ſituation appeared ſo deplorable, that neither Mr. Lawrence or myſelf expected he could ſurvive many days. I happened at that time to recollect, that you had ſomewhere obſerved, that the good effects of the aqua alkalina mephitica could not be referred merely to its ſolvent property, as relief was, in many caſes of calculus, experienced ſoon after the remedy was taken into the ſtomach; and as your obſervation ſeemed to imply a ſedative effect, that I had not before ſuppoſed it to poſſeſs, I propoſed as a laſt and forlorn reſource the trial of it. It was determined that he ſhould be immediately put upon its uſe; but when it was conſidered, how much time would be expended in its preparation, we were obliged to reſign the idea, as the poor man appeared to be too near his end to admit of the neceſſary delay. His pulſe was now ſo ſmall as to be ſcarcely perceptible, and ſo quick as to make it difficult to reckon them; the mucus drain varied from two to three pounds in the day and night; and to his pain, which was very great at all times, but extremely ſo upon the contraction of the bladder after the diſcharge of either mucus or urine, and to his other bad ſymptoms, were now added colliquative ſweats,—all of which when conſidered induced a belief, that he could not ſurvive till it could be prepared. I then thought of the ſubſtitute that had been propoſed by you for thoſe to whom the *aqua alkalina mephitica* could not be rendered on account of its expenſiveneſs. I mentioned it to Mr. L. and it was concluded that he ſhould take it till the other medicine could be prepared, if he lived ſo long. Accordingly, two drachms of the dried ſoda was mixed with an equal quantity of the beſt ſoap, 12 drops of the eſſential oil of nutmegs, and the maſs when made up with ſyrup was formed into 48 pills. He was directed to take four of them three times a day in a draught of the D: Hord: comp. At our viſit on the morning of the 29th, when he had taken only three doſes of his pills, we learnt with pleaſure and ſurpriſe, that he had ſlept a little in the night, and that his calls to diſcharge urine had not been ſo frequent; and, in ſhort, we ventured to hope that he was ſomething better; our viſit at night confirmed the hope of the morning. On the 30th we were told that he had ſlept more than he had done the preceding night, that the pain was abated, and that all his bad ſymptoms were alleviated. The next day (Oct. 1.) we were gratified by further proof of amendment: the mucus diſcharge was much diminiſhed, the waſting ſweats not ſo profuſe, and his appetite beginning to return. From that time every thing went on well; and by the 13th of the month every inconvenient ſymptom, except an inability to retain ſo large a quantity of urine, as he had been accuſtomed to do, previous to the inflammation of his bladder, and except ſome remaining weakneſs, had compleatly left him. He has continued free from any return of ſuch indiſpoſition to the preſent day.

I have thus given you the hiſtory of a diſeaſe, that, in this inſtance, afforded a hopeleſs proſpect, and that but too often diſappoints the beſt directed efforts of the moſt ſkilful Practitioners; but which I am inclined to hope and expect, not only from the event of this remarkable though ſolitary caſe, but alſo from analogous effects in ſome that have ſince fallen under my obſervation, where the action of the membranes of the bladder appeared to be ſimilar, and where the ſame kind of diſtreſſing ſymptoms were experienced, but where examination proved the exiſtence of a diſeaſed proſtate in one inſtance, and calculus in two others,—that if the medicine be further tried, that a ſimilar reſult will follow. Should it prove ſo, an additional remedy in one of the worſt diſeaſes will be added to the preſent limited number of thoſe that *appear* to produce uniform and ſpecific effects.

BRISTOL, I am, Dear Sir,
Auguſt 24, 1796. Yours,

THOMAS BAYNTON.

APPENDIX.

No. IV.

Dear Sir,

IF all the circumſtances of the following caſe were detailed, they would perhaps juſtify the ſanguine expectations that I ventured to acknowledge I had formed of the almoſt infallible efficacy of the Soda Pills, from what I had obſerved of its effects in one caſe of dyſuria mucoſa that I gave to you at length, and ſome others that I hinted at in the cloſe of the Letter that contained that communication; but I am at preſent ſo circumſtanced as only to be able to give you an outline of the caſe, and a general account of the means that were made uſe of whilſt he was under my care: I am however enabled to give additional weight to the relation, by the mention of his name; as he has very frequently ſolicited me to make known a remedy that he conſiders as having preſerved him from an untimely Death.

Mr. John Henderſon, of the Pariſh of St. George, Aged 55, requeſted me to attend him at his Houſe at the beginning of Auguſt laſt, for a complaint of the Bladder and Urinary paſſages: Upon enquiring into his ſymptoms and examining the parts, I learnt that he had paſſed his water with pain and difficulty upwards of Seven Years, and that for a conſiderable time he had diſcharged more or leſs of that mucous material which I believe it is the peculiar and excluſive province of the membranes of the bladder to ſecrete; I alſo diſcovered that about midway between the ſcrotum and the Anus there was a conſiderable fulneſs of the perineum, and that one ſide of the ſcrotum was larger than the other in conſequence of a thickening of the Tunica Vaginalis, upon which I enquired if he had at any time received a blow or other violence upon thoſe parts; he told me that about ſeven or eight Years before, he recollected to have fallen when on ſhipboard, upon that part of the ſhip that is called the rough tree, and that as thoſe parts were then ſtruck he thought it poſſible, tho' he felt but little pain at the time, that the foundation of the injury might have been then laid, more eſpecially as he had ſince that time been ſubject to Hydrocele, and had been tapped twice on that ſide of the ſcrotum which I had obſerved to be thickened; this led me to enquire what aſſiſtance had been afforded him, and by whom it had been rendered; he mentioned the names of four Gentlemen that had attended him *ſingly* the greateſt part of the time that he had been indiſpoſed; he ſaid that he had taken ſo immenſe a quantity of medicine with ſo little advantage, that he had determined never more to apply to any medical Gentleman, and had been prevailed upon to conſult me againſt his inclination by the importunity of a friend.

Such an account would have diſcouraged me if he had mentioned the names of Gentlemen that I had not known, at a ſeaſon like the preſent when the ſources of information are acceſſible to all; but as it happened that I was perſonally informed of the ſuperior ability of thoſe that had been conſulted, I could not but have deſpaired of being able to afford him any aſſiſtance if I had not been ſo lately convinced of the powers of the Soda in ſimilar caſes. Symptoms of ſtricture in the Urethra induced me to endeavour to paſs a Bougie; and I diſcovered that the canal was obſtructed by the tumor in the perineum; the information thus obtained, induced me to conſider the affection of the bladder as a mere ſympathetic action that was kept up by the irritation that was given to the Urethra and the Bladder by the tumor in the Perineum; I therefore applied Leeches to it as often as the Patient's ſtrength would allow, and attempted by the application of cold and other auxiliaries to procure its reſolution; the event was contrary to my expectations, and a diſeaſe that had ſo long remained in an indolent ſtate became active and ſuppurated ſoon after the above means were applied to produce its reſolution; it was allowed to break, as it pointed in a depending part, and after a conſiderable ſlough had ſeparated (tho' the Urine paſſed for ſome days through the wound) in the courſe of three or four weeks it healed, with no other treatment than light ſuperficial dreſſings and frequently repeated warm poultices applied over them; the obſtruction was now removed, and I hoped the effect would ceaſe as the cauſe no longer exiſted, but in this alſo I was miſtaken, as it was afterwards continued by Habit, as Mr. Hunter would have ſaid, and much pain experienced with frequent and diſtreſſing Mucous diſcharges. It will not be wondered even by thoſe who have ſeen how much I have been indebted to the Soda that I ſtill ſhould ſuppoſe Opium the beſt adapted remedy for *pains* that were occaſioned by an obſtruction in the Urethra, or that I ſhould pertinaciouſly continue to exhibit it with the hope of its *alleviating* my Patient's ſufferings; but I am obliged to declare, that although ſome relief was obtained by its uſe, I was compelled by the progreſſion of the diſeaſe to apply again to the Soda: Again its good effects were aſtoniſhing, and by its uſe alone the Patient, after trying under my care many remedies, and under the direction of the other Medical Gentlemen, *perhaps* all that ſcience could ſuggeſt, has been reſtored to his Family in almoſt perfect health, with no other remaining inconvenience than a ſlight diſpoſition in the diſeaſe at times to return, which his pills always remove very ſoon after they are taken. Any other particulars Mr. H. will at any time be happy to ſatisfy you in.

I am, Dear Sir,
Your ſincere Friend and Servant,
THOMAS BAYNTON.

Nov. 6, 1796.

NOTE by the EDITOR.

I Formerly publiſhed (*Obs. on Calculus. Murray.* 1792. *p.* 24.) the caſe of Mr. D. Lloyd, who had intenſe fixed pain in his loins, and diſcharged mucus with his urine, but never any gravel; and was wonderfully relieved by ſal ſodae. That caſe, wits the two preceding, render it probable that alkalis in relieving calculus, act on the mucus membrane rather than as ſolvents; and they would much confirm the opinion of Drs. Darwin and Auſtin on the nature of calculus, if the opinion needed confirmation. In the *Med. Commentaries* for 1795 there is an account of a diſeaſed bladder with mucus diſcharge, cured by injections—firſt, of oil and lime-water with watery infuſion of opium, and afterwards of ſolution of vitriol of zinc and mucilage with infuſion of opium. In that caſe alkali does not, from the account, appear to have been tried. It would probably have ſucceeded, and ſhould always be exhibited before recourſe is had to injections into the bladder.

APPENDIX.

No. V.

NOT many days after the receipt of Mr. Scott's paper on nitric acid (No. II.) the Editor was conſulted on a ſingularly obſtinate caſe of ſuppoſed Lues Venerea. Above ten months ago, the patient had ſlight gonorrhœa; and after the uſe of ſome common remedies he thought himſelf nearly well, when a ſmall ulceration appeared on the *glans penis*. I am not informed whether this ulcer ſhewed the characteriſtics of chancre; but by the advice of an experienced practitioner, he now took the mercurial pill night and morning, and rubbed in mercurial ointment. This courſe was continued for near eight weeks without any ſoreneſs of the mouth, or amendment of the ulcer. In about four months from the firſt ſeizure, under the continuance of the ſame plan, an ulcer appeared in the throat, and the medicines were exhibited more largely for ſix weeks—and he was at the end of this time rather worſe than better. The patient was now confined to his apartment, and mercury uſed more vigorouſly in both ways. In the courſe of five weeks the ulcer was reduced to a third of its former extent; its pain had ſubſided, and the gums felt ſlightly ſore. After this time, the chancre(?) was in a fluctuating ſtate, ſometimes healing rapidly, and then ſpreading to its original dimenſions; nor was any farther advance made towards a cure, though corroſive ſublimate was employed alternately with other preparations of mercury. Eight months after the firſt attack, there was obſerved, near the ſore, a gangrenous ſpot; having nothing of the appearance of a ſpreading venereal ulcer, but exactly ſuch as is ſometimes ſeen after long mercurial courſes. The mercury was reduced; cicuta applied, and taken with bark and ſarſaparilla; a grain only of calcined mercury being given at night, with half a grain of opium.

The Editor produced Mr. Scott's paper, and recommended a trial of his method, to which the patient and his friends chearfully conſented. The nitric acid was accordingly taken with perſeverance for ſix weeks, and for a time to 200 drops a day. Meanwhile the ulcer rather extended than diminiſhed; its ſurface looked cleaner, but no tendency to incarnation appeared. Immediately on taking the acid no ſenſation was felt in the ſtomach, either pleaſant or otherwiſe, except during the firſt, ſecond or third days, when it griped a little—No increaſed warmth of the ſkin—no effect on the pulſe. The night-ſweats (which were certainly leſs after the mercury was reduced, and the bark and ſarſaparilla employed) declined rapidly, after the acid was begun upon.

The acid being now gradually reduced to 80 drops a day, its inefficacy in this caſe became too apparent. The ulcer ſuddenly put on a worſe appearance, and increaſed rapidly. Inflammation of the ſound part of the glans, and a degree of phymoſis ſucceeded.

Opium with bark has been ſince adviſed upon the ſuppoſition that the ulcer is a mere ill-conditioned ulcer, and now no longer of a venereal nature, whatever it may have been before the employment of mercurial medicines.

CASE of Mr. H.

DEAR SIR,

I RECEIVED your obliging favour on the day it was written, and perceive by its manner that you are as much and as agreeably ſurprized by the information Mr. H.'s Letter to me affords, as I expected you would be. I think with you that the Public ought to be made acquainted with the hiſtory of his caſe, together with the contents of his Letter; and as I have perſonally witneſſed what he has recorded, I ſhould have to accuſe myſelf of inhumanity, if I were to ſuffer any perſonal conſiderations, that reſpect either my time, or my unwillingneſs to appear ſo often as a narrator of uncommon caſes in one pamphlet, to prevent my furniſhing you with all the particulars within my knowledge. I therefore with cheerfulneſs and pleaſure undertake to give you, as far as I am able, with the aſſiſtance of my day-book and recollection, the account of a caſe that you ſay will conclude your pamphlet, "and make a noble concluſion." But as it may be aſked how I came to be acquainted with the effects of the remedy before its publication, it may not be amiſs for me to ſtate that, when Mr. Biggs, your Printer, furniſhed me with the proof-ſheet for reviſion that contained the account of Mr. Henderſon's caſe, I was ſtruck with Mr. Scott's communication which occupied the preceding part of the ſame ſheet; and as ſoon as an opportunity permitted, I informed you that I had a venereal patient under my care, whoſe caſe had reſiſted mercury in almoſt every known mode of exhibition, and that I ſhould wiſh to try the nitric acid as there recommended, and requeſted that I might be favoured with your company when I viſited the patient the next morning, as well to aſſiſt me with your opinion reſpecting the appropriate doſe, &c. as to give you a demonſtration of the caſe being almoſt as bad as ever had been obſerved by any practitioner. You obligingly promiſed to be with me at nine in the morning; but about that time I received a note from you, wherein you informed me that a profeſſional hindrance would prevent your being with me, and that upon reconſideration you thought the reaſoning of Mr. Scott, who refers the advantages obtained "to oxygenation of the ſyſtem," ſo unſatisfactory, that you would adviſe a very doubtful prognoſis to be given to the patient, if he were put upon a trial of it. I was ſo much influenced by your opinion, that I ſhould have omitted to make uſe of it, had I not the preceding evening ſhewn my patient Mr. Scott's account, and told him that he might expect a viſit from you in the enſuing morning. A man in his ſituation, that had for nearly two years experienced the inefficacy of what he had been frequently told was the whole of the known remedies that the art afforded, was not likely to give up the uſe of that which was aſſerted to be a tried remedy in another part of the world, though it was unknown in this; and although I made him acquainted with the contents of your note, he was no way diſcouraged, but earneſtly petitioned for its immediate exhibition. I have thus ſtated in a plain and candid manner the way in which I was led to its uſe. And if there ſhould be any perſon, who, after what has been ſaid, can ſuppoſe that any miſtake in the nature of the caſe, or miſrepreſentation of the facts can have happened—or (which is more agreeable to believe) if any gentleman ſhould wiſh to aſcertain in a more particular manner the facts that preceded and accompanied the adminiſtration of a remedy of ſo much apparent importance in a diſeaſe ſo hopeleſs, I am happy to ſay, that my patient's very laudable humanity would induce him to ſink the conſideration of what he might feel in ſatisfying ſuch enquiries, in the hope of aſſiſting by his confeſſions ſome unhappy fellow ſufferer.

On the 8th of February 1795 I was requeſted to viſit Mr. ——— with pains of the limbs and ulcers of the throat and tonſils, which from appearances ſuſpecting to be a caſe of cynanche maligna, induced me to preſcribe bark wine, and gargles. That plan was perſevered in until the 19th without any advantage. From that circumſtance, conjoined with the ſituation of his pains and the times of their aggravation, I began (though my patient was married, and the father of healthy fine children) to ſuſpect the caſe to be venereal; and after expreſſing my ſuſpicions, I learnt from him that he had contracted ſuch a diſeaſe ſome years before, and had at that time an ulcer on the penis; but that he ſuppoſed himſelf perfectly cured, having paſſed through a regular courſe of medicine for that purpoſe: it was with difficulty that I convinced him that his preſent ſufferings were referable to ſuch a cauſe. However, poſſeſſing his confidence, I prevailed upon him to commence a mercurial courſe, and he continued to take from that time to the 8th of March a grain of calomel, with an equal quantity of the ext. papav. three times a day, in the third part of a pint of the decoct.

lignor cum rad. mezerii. On that day, in conſequence of the appearance of ſome eruptions, the form of the medicines was exchanged for the following

℞ Hydrarg. Muriat. gr. iv.
Aq. cinnam. ℥iv. *m* cap. coch. larg. noct. maneq.

This was continued until the 27th of April, and then a drachm of the ung. hydrarg. fort. was ordered to be rubbed into the thighs every night at bed-time, and the former medicine omitted on account of the eruption having yielded, though the pains had increaſed: this, with the decoction of the woods and mezerion, was continued till the middle of June. On the 20th of October he began to take four grains of the blue pill with a quarter of a grain of opium three times a day; and it was continued without intermiſſion until the middle of January 1796. On the 14th of that month calomel with opium were again uſed in its ſtead, and continued until the middle of February. On the 12th of July he again commenced its uſe, and continued to take it until the middle of Auguſt laſt, when I was obliged by the fulleſt experience of the inefficacy of all the mercurial preparations that had been tried, to again requeſt him to deſiſt from the uſe of all medicines, except occaſional opiates to mitigate his pain, which it had been neceſſary for him to uſe with the greateſt freedom during the whole of the mercurial courſe. It will here be neceſſary to remind you, that when I firſt was called to his aſſiſtance I found him labouring under only the conſtitutional or ſecondary ſymptoms of the diſeaſe; and as I did not keep any minutes of the caſe, I cannot ſpeak with that exactneſs I would wiſh of the particular effects of the different preparations of mercury that were exhibited. But I have the fulleſt recollection, that the ulcers of the throat and the affection of the ſkin were removed in due time by the means that were adopted: and although there was a complete failure in my attempts to diſlodge the poiſon from the bones, I am not convinced that the failure reſulted from the incompetency of the mercury to produce ſuch an effect—as the conſtitution of this patient was rendered ſo irritable by the diſeaſe, or the means made uſe of, (or perhaps both) that I was never able to impregnate the ſyſtem with a ſufficient quantity to produce the deſired effect; though it was exhibited with every precaution, and united with every corrective that my judgment could ſuggeſt, conjoined with the advantages of country air, bark, milk diet, and the occaſional omiſſion of all medicines, which for a time anſwered ſo well, as to make my diſappointment the greater at each time of the diſeaſe returning. At laſt, medicine of almoſt every kind failed to afford even relief, and I was reduced to the neceſſity of being content with the mere palliative effects of opium given in large doſes. The peculiarities of this caſe are however too common; and every practitioner that is much engaged in a large city, eſpecially if it be a ſea-port, muſt have had to deplore ſuch occurrences. It was my good fortune to meet with Mr. Scott's communication, in the way before deſcribed, juſt at the time when I had exhauſted my endeavours to cure this patient—and when I ſay with him, that he was indeed a "rueful ſpectacle," with little more than diſeaſed bones remaining, when he began the uſe of the nitric acid; and that he now appears in good health, I contemplate with aſtoniſhment the change that has been produced: more eſpecially as he was always labouring under profuſe ſweats, diarrhœa, or ptyaliſm, from the mercurials that were exhibited, though they were ſo guarded; and has now obtained a cure by the uſe of a moſt powerful acid, without experiencing even momentary inconvenience, and in leſs time than would have been requiſite to remove even the mildeſt ſymptoms of the diſeaſe by any other known method. How much will the pleaſure, that the effects here related have afforded me, be increaſed, if the future experience of my profeſſional brethren ſhould coincide with what was obſerved in this very melancholy caſe: and that it may prove ſo in caſes that are ſimilar I entertain the greateſt hope, as the effects appeared to depend ſo fully upon the aſſigned cauſe, that no doubt can poſſibly remain upon my own mind of the acid being the true and only cauſe of the changes that followed. It will be recollected that the poiſon had in this caſe obſerved its accuſtomed laws, and after traverſing the ſyſtem, and ſucceſſively diſplaying its character upon the genitals, fauces, and ſkin, it had affected the bones; from whence moſt practitioners have found it difficult, and ſometimes impoſſible, to diſlodge it. Perhaps it may not be difficult to conceive that a remedy, poſſeſſing ſuch chemical power, and having ſo ſtrong an affinity for the matter that analyſis tells us conſtitutes bone, may produce a cure in this ſpecies of the diſeaſe, and not be attended with equal effects where only the ſoft parts are affected by the poiſon. That this ſtage is the moſt difficult to remove, and that it is often impoſſible to accompliſh it, I have before ſaid, is known to moſt practitioners. May this remedy ſupply the deſideratum of this branch of the healing art, and the name of your correſpondent Mr. Scott will then be deſervedly remembered by every friend of ſcience and improvement. Why ſhould it be ſo difficult to believe the exiſtence of other ſpecifics for the poiſon in Europe, when it is recollected that the South-ſea iſlanders, and ſome tribes of the native Americans have found in the vegetable productions of their countries remedies for the worſt ſtates of the diſeaſe?

I have thus endeavoured to comply with your requeſt as fully and particularly as the circumſtance of my having kept no minutes of the caſe will allow me; and as the recollection of the patient will be long kept alive by what he has ſuffered, I think that his own letter may be as ſatisfactory as any account from me of the ſituation he was in, when he firſt made uſe of the medicine that has occaſioned his cure. And I can ſafely aſſert that I believe his account to be a moſt faithful repreſentation of his ſituation. You have ſeen it in his own writing, and he has been taught to expect a viſit from you. I therefore requeſt that you will at an early interview with him oblige me by ſatisfying yourſelf of the whole of what is here aſſerted; and then, if it be in time for your pamphlet, ſubjoin your teſtimony to that of

Your ſincere Servant,

Nov. 28, 1796. THOMAS BAYNTON.

To Dr. BEDDOES.

DEAR SIR,

PURSUANT to your requeſt at your laſt viſit, I take my pen to deſcribe (if poſſible) the deplorable condition and ſufferings I have endured for near two years laſt paſt, and the almoſt miraculous deliverance therefrom by your care and unwearied attention thereto.——I was firſt ſeized with ulcers of my throat and violent pains in my ſhins at night, that threw me into ſuch perſpirations, that for nine or ten mornings I was under the neceſſity of changing my linen before I could poſſibly get up; which was ſoon followed by or with excreſcences or nodes from my knees almoſt down to my inſteps, attended with violent pains in my head. My arms alſo were attacked with excruciating pains, where ſwellings of a conſiderable ſize made their appearance. My knees alſo ſwelled, and the pain ſo acute, that I durſt not move them the leaſt aſide: ſleep fled—nor did it return for ten weeks. And for twenty-two weeks I could not bear to be moved without ſuffering the moſt extreme torture, notwithſtanding your tender care to adminiſter every thing you could deviſe and preſcribe for my relief. I knew you perfectly underſtood my caſe; but my diſeaſe ſeemed to baffle the power of medicine and every effort. Having for the then laſt thirteen weeks lived wholly upon milk, you adviſed me to diſcontinue the medicine, in hopes I might ſoon be able to make uſe of ſtronger food, and recover a little ſtrength. This treatment had the deſired effect: and my pains for ſome time ſeemed to abate; but, alas! they ſoon returned again! when you adviſed another courſe of medicine, which operated more powerfully than it hitherto had done, and in a few months reſtored me ſo as to enable me to walk from my lodgings in the country to town. The ſatisfaction you expreſſed on the occaſion I ſhall never forget, and with myſelf was in hopes of a radical cure. But at the end of three months my hopes were deſtroyed by a violent relapſe, which ſoon confined me to my bed. My legs (if poſſible) were worſe than before;

for not only my ſhins, but the main bones pained me dreadfully. One node formed (a little below my right knee) in a ſhort time almoſt as large as an hen egg. The pains from my ſhoulders to my fingers ends I can ſcarcely deſcribe. The ſinews of my arms, thighs, and legs ſtiff and contracted—my fingers I could by no means bend; they were fixed by diſeaſe, and every joint ſwelled. The bones of my head ſhared equal with the parts I have deſcribed; and nothing but death was expected to put a period to ſuch a ſcene of miſery. Added to this, my body was a rueful ſpectacle, a mere ſkeleton; ſo that diſeaſe had nothing left but my vitals for its prey. This, Sir, is a faint deſcription of the ſtate and condition you found me in about three weeks ago, when you viſited me, and with joy in your countenance told me, a new diſcovery had been made of a medicine that you had great hope would reach my caſe; and with your wonted goodneſs of heart cheered up my drooping ſpirits by deſcribing to me its mildneſs and efficacy in ſeveral caſes ſimilar to my own. Encouraged by this information, and relying upon your judgment, I was determined to give it a fair trial. I began, and continued to take the quantity as preſcribed.—At the expiration of ſeven days I found it begin to operate, as you had before deſcribed, by creating a ſaliva in my mouth. On that day I had a deſire to be lifted from my bed, and to ſit up a little, which was done with ſome difficulty; but could not bear my feet on the ground, my knees alſo being in a very debilitated ſtate—but found my pains greatly abated. I ſpit a great deal the next night, which was very thin, and not diſagreeable. On the eighth day my pains ſeemed quite gone; and requeſted again to get up, when to my great ſurprize I found myſelf capable of bearing the weight of my body on my legs. On the ninth day I was capable and abſolutely walked from my bed to my chair, the diſtance of ſix feet, without aſſiſtance.—I beſpoke a pair of crutches, but, thank God, I never uſed them, nor have had occaſion for them; for on the tenth day I walked ſeveral times backwards and forward my room

without

without crutch or ſtick, or any other aſſiſtance whatever. On the eleventh day I walked from one room to another, and finding it attended with no extra pain, but ſtiffneſs and weakneſs in my ſhins, I abſolutely walked up a pair of ſtairs of fourteen or ſixteen ſteps, and down again. My appetite was now reſtored to an amazing degree, inſomuch that I found I could not continue the uſual quantity of medicine (which in fact ſeemed to have operated more like a charm than a medicine) but I continue taking about three parts in four thereof daily. And I have the pleaſure further to inform you, that I have walked out ſeveral times, and yeſterday in particular I walked more than a mile, and was in hopes to have ſurprized you (which I know would have been an agreeable one) by paying you a viſit at your own houſe; but was informed you was from home.—Be aſſured I ſhall always eſteem it a pleaſure to anſwer any queries reſpecting my caſe, and the efficacious operation of the acid in ſo wonderful a cure.

Believe me to be
Dear Sir,
——— ———

BRISTOL,
Nov. 25, 1796.

To Mr. BAYNTON.

Nov. 29, 1796. The Editor in company with another perſon met Mr. H. at Mr. Baynton's. Mr. H. by word of mouth confirmed the preceding ſtatement; and added a variety of particulars reſpecting his former and preſent ſtate. He ſaid that his daily doſe of colourleſs ſtrong nitrous (nitric) acid was two drachms, diluted by a quart of water. The mixture produced no immediate ſenſation in the ſtomach. He was never griped by it; and he thought it rather aſtringent; for he had no ſtool in three or four days after beginning this courſe, which was unuſual with him; but he would not take any aperient medicine, that nothing might interfere with the acid. On the ſeventh day he perceived a flow of ſaliva; on the eighth the ſalivation amounted to a quart; and it has continued in a greater or leſs degree ever ſince. There was no ſoreneſs of the mouth, or any of the feelings which had formerly been produced by mercury. In two or three days after this effect on the ſalivary glands, he loſt his night pains. On being lifted out of bed, he was aſtoniſhed to find he could ſtand without ſupport, " whereas" ſaid he, putting his hand on his knee, " theſe limbs could not before " have ſuſtained a ſingle ounce." The nodes, which were of the ſize of a hen's egg on the tibia, and of which there were ſeveral on the back part of the humerus and radius of one arm, began to diminiſh. The Editor, who had this interview three weeks after the firſt exhibition of the acid, found the tibiæ rough, but without excreſcence; all the nodes having diſappeared. Mr. H.'s noſe, which had been conſiderably enlarged, was now of the natural ſize. His hands, which had been " a miſhapen maſs," had no preternatural appearance. Before, he could not bend any of his fingers; now he could bend them all, but the forefinger of the right hand. A great difficulty of deglutition had diſappeared at the commencement of the ſalivation. His general bodily condition had been much amended, and his appetite had become ſo keen, that he could hardly find time enough in the day to eat and to take his diluted acid.

This account fully confirms an important part of Mr. Scott's aſſertions. And the effect of the nitric acid in the inſtance of Mr. H. furniſhes an additional probability that the firſt caſe in this Number was not venereal, when the patient began to take the acid. The reſult of that caſe goes ſome way towards determining the limits of its power, which cannot however be fixed without a number of experiments. The Editor has the pleaſure to add that he has before him a letter from an accurate medical obſerver, in which he ſays that " he has uſed nitric acid with great advantage in ſome caſes which he believed to be hepatic, and in one venereal caſe with apparent advantage."

An ingenious friend had conjectured from Mr. Scott's paper, that nitric acid only renders the ſyſtem ſuſceptible of the mercurial ſtimulus. But Mr. H. took no mercury between the middle of Auguſt, and the ſecond week in November. In the effect too on the mouth Mr. H. remarked a ſtriking difference.

The Editor flatters himſelf that to have aſcertained the mild action of the nitric acid in theſe two caſes, and its effect in checking night-ſweats in the firſt, will, in all likelihood, prove advantageous to medicine in various reſpects. The perſonal examination of Mr. H. has put it out of his power to doubt of the utility of Mr. Scott's practice. He reckons its ſucceſs among the fruits that were to be expected from the cultivation of the pneumatic phyſiology. He felt from the firſt that his particular ſpeculations were precarious, and he ſome time ſince gave up his ſuppoſition relative to the ſtate of the ſyſtem in conſumption. *(See ſecond Edition of parts* I. *and* II. *of Conſiderations)*. But he was confident that if he could fix the eye and the mind of his medical contemporaries on thoſe agents, upon which the mechaniſm of life ſo immediately depends, they would not fail ſpeedily to acquire much of that power, which the knowledge of nature confers.

The diſcovery of every new *specific* (or ſubſtance capable of correcting given morbid actions of the ſyſtem) affords a new reaſon for believing in the exiſtence of others. For ſome ſcrophulous ulcers we ſeem to have found a new ſpecific in ſorrel; for venereal and hepatic affections in nitric acid, ſuch as we poſſeſſed before in mercury. Theſe are diſeaſes, in themſelves not many degrees leſs formidable than cancer and conſumption. We have analogies enough to perſuade us, that there is no leſion of organization, induced by the powers of the living body modified in one way, which the ſame powers, differently modified, may not repair; and that, by dint of frequent ventures, ſome happy hand will draw from the lottery of Nature a remedy for each of thoſe diſeaſes, which at preſent moſt baffle the phyſician and torture the patient.

APPEN-

APPENDIX.

N^o. VI.

Extract from a Paper, entitled *Inſtruction concerning the means of preſerving ſalubrity, and purifying the air, in the military hoſpitals of the French Republic*, as it appeared in the Journal de Phyſique, Ventoſe, an 2^e ére franç.

AU nombre des moyens que la chimie a employés avec un ſuccès qui tient du prodige, pour opérer cette dépuration (des lieux infectés), nous citerons le procédé que *Guiton*, repréſentant du peuple, a mis en uſage en 1773, dans la ci-devant cathédrale de Dijon, infectée par des exhumations, au point qu'on fut obligé de l'abandonner.

Ce moyen conſiſte à répandre dans l'atmoſphère, de l'acide muriatique (acide marin) en état de gaz, dégagé par l'intermède de l'acide ſulfurique (huile de vitriol). Voici le procédé pour déſinfecter une ſalle de 40 à 50 lits.

Après avoir évacué les malades ſur une des ſalles de rechange, diſpoſez dans le milieu de la ſalle vuide, dont les fenêtres & les portes ſeront fermées, un fourneau garni d'une petite chaudière ou capſule de fer à demi remplie de cendre tamiſée ſur laquelle on poſera une capſule de verre, de grès, de fayance même, chargée de neuf onces de muriate de ſoude (ſel marin) légèrement humecté, avec une demionce au plus d'eau commune.

Le feu étant allumé & la capſule échauffée, on verſera ſur le ſel marin quatre onces d'acide ſulfurique, ou huile de vitriol du commerce. En un inſtant l'acide ſulfurique agira ſur le ſel marin dont l'acide ſe mettra en expanſion. L'opérateur qui ſera le pharmacien en chef, ou un de ſes aides verſé dans le manuel des opérations chimiques, ſe retirera en fermant la porte ſur lui & emportant la clef.

Douze heures après on entrera dans la ſalle. On ouvrira portes & fenêtres pour établir des courans d'air, & évacuer celui qui pourroit être encore chargé d'acide.

On donnera une plus grande latitude d'utilité à ce procédé en l' appliquant aux ſalles même remplies de malades, toutes les fois que les Officiers de Santé le jugeront néceſſaire. Ainſi, lorſqu'on aura reconnu que l'air d'une ſalle eſt ſurchargé de miaſmes animaux, & a beſoin de cet excellent purificateur, il ſuffira de faire le tiers du mélange cideſſus & même moins, & de la parcourir plus ou moins lentement et dans tous les points, le réchaud à la main, au moment où le gaz ſe met en expanſion. Lorſque la ſalle ſera jugée ſuffiſamment remplie de gaz acide muriatique, on tranſportera l'appareil dans les latrines, afin que les dernières portions gazeuſes que le mêlange pourra continuer de fournir, ſervent à neutraliſer les gas ammoniacaux putrides qui ſe développent continuellement dans les privés.

Cette opération *qui n'occaſionne aucune ſenſation déſagréable ni incommode*, ſuffira néanmoins pour ſanifier une ſalle; & on pourra l'employer tous les jours, & même plus ſouvent d'une manière partielle, dans les ſalles où un ou pluſieurs malades affectés de gangrène ou de quelqu'autre maladie putride, répandroient des miaſmes dangereux. Dans un cas d'urgence, s'il ſe trouve dans la pharmacie de l'acide muriatique concentré (acide marin fumant) on obtiendra le même effet en portant dans les ſalles la bouteille ouverte; & ſi cet acide n' eſt pas aſſez concentré, on le chauffera pour le réduire en état de gaz. Enfin, on répétera ces différens procédés toutes les fois qu'il ſera jugé néceſſaire par les officiers de ſanté, ainſi que cela ſe pratiquoit pour les inutiles & même dangereuſes fumigations aromatiques.

Fumigations with mineral acids muſt, like the telegraph, have been introduced into the Britiſh military ſyſtem. But Dr. J. C. Smyth has earned a civic wreath by firſt labouring to introduce them, though here the trials took place near two years later than they were enjoined by public authority in France; and his experiments on the reſpirability of the copious fumes of marine or nitric acids were not, I underſtand, made before July or Auguſt 1795.— When Dr. Smyth however lays claim to the merit of more exact, early, and comprehenſive views, it is more than doubtful whether his pretenſions will be admitted by the impartial hiſtorian of medical ſcience. The Doctor deſcends to carping objections, and he

ſtrains very hard to eſtabliſh diſtinctions in doctrine and practice between himſelf and the French phyſicians. I have above been at ſome pains to enable the public to judge whether theſe diſtinctions are juſt: and I ſhall here produce what I conſider as no trivial miſtatement of the opinions of the *council of health*. "The French phyſicians" ſays Dr. Smyth, "appear to me to have fallen into a conſiderable "miſtake on this ſubject in taking the quantity of "carbonic acid preſent in an hoſpital *as a* TEST *of* "*the quantity or malignity of contagion*, when, in "reality, they are two things totally diſtinct from "each other." (pp. 204. 205.) In a note he adds, "The method propoſed by the French phyſicians "for aſcertaining the quantity of carbonic acid is "ſimple and ingenious. Take two phials: let one "be filled with common water, the other with lime-"water. At the place where you want to try the "purity of the air, empty the phial of common "water, then filling it half-full with lime-water "and corking it, ſhake the phial for ſome time: "the quantity of ſediment ſhews the proportion of "carbonic acid. But to render the preceding ex-"periment concluſive, the height from the ground "at which the air is taken ſhould be ſtated; *other-*"*wiſe we are liable to great fallacy.*"

Now as the great point ro be aſcertained is the condition of the air which the patients are breathing, it happens that the authors of the *inſtruction* have been much more judicious than if they had aſſigned a certain height. They direct the air to be taken near the bolſters of the beds. *Dans les angles & vers le chevet des lits des malades.* They doubtleſs knew of Mr. Lavoiſier's experiments on the air of crowded rooms, taken at different heights, and could have applied them, had the occaſion been proper. There is however a juſt exception (and it is mentioned by Mr. Lavoiſier as rendering the experiment abortive) to their method. A quantity of carbonic acid air is abſorbed by the common water, as it iſſues out of the phial.

The French council (and here is the miſtatement) by no means ſpeaks of carbonic acid as any TEST of contagion. They properly employ a looſe expreſſion. *Il paroît très-vraiſemblable, d'après les nouvelles connoiſſances ſur la nature des gaz, que dans les ſalles ſuſpectées d'inſalubrité, les miaſmes putrides ſont toujours accompagnés d'une* aſſez grande quantité *d'acide carbonique.* (p. 170.) They ſeem here to hold in view places, where animal ſubſtances have fermented, full as much as thoſe where the ſick breathe; and it is true that in both there will be "*a good deal*" of carbonic acid air, particularly in the former, as the meritorious reſearches of Mr. Lavoiſier have ſo fully proved.

The foreign philoſophers will aſſuredly not deem it worth while to examine the book of their *would-be-critic* with a prying pick-fault eye. But they will ſmile to find one who is perpetually either ignorant or miſtaken concerning familiar chemical facts, preſuming upon "thoſe improvements, which *a more* "*accurate chemistry*, and a long attention to the ſub-"ject have ſuggeſted to him." (On Jail-diſtemper, p. 181.) The uninſtructed may be amuſed by obſerving how he hunts overſights, ſplits hairs, publiſhes what he acknowledges to be a ſuperfluous exhibition of his own merits,* and anxiouſly calls to his aid every little art, by which the intereſt of his vanity may be promoted. The ſubſtitution of nitre for common ſalt was a good, though obvious, thought, and ſeems to have anſwered excellently. But what there is of diſcovery—viz. the having ſtrictly aſcertained that acids will deſtroy contagion, and the proceſs for extricating the fumes—properly belongs to Mr. Morveau. Otherwiſe, ſhould any one try fumes of *acetic* acid, if he finds the progreſs of infection ſtopped, he too, if he ſhould chuſe to aſſume a ſelf-trumpeting tone, may claim to be a diſcoverer; and he would have to ſay that his predeceſſors ſtrangely overlooked *acetic* acid, though of all acids the moſt agreeable and reviving to the ſick.

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* *Memorial to Lord North* (p. 227), of which he ſays, "others (beſides his friends) "may conſider it as ſo many blank pages," and in which he tells Lord North "how during the intervals of the "operation of a violent emetic, he continued to dictate inſtruc-"tions to the ſurgeon . . . . . being apprehenſive leſt the "fever" ſhould ſeize his head. (p. 234.)

APPENDIX.

N^o. VII.

Extract from a Letter on Femoral Hernia.

DEAR SIR,

I HAVE great ſatisfaction in ſaying, that Captain Hemſley has, ever ſince I wrote laſt, continued gathering ſtrength. I ſaw him a few days ago, when he aſſured me, he entertained little doubt of ſpeedily reaſſuming the command of his veſſel.—I ſhould have written to you ſome time ago, had it not been that I wiſhed to communicate the following caſe: Being called to a conſultation in a caſe of crural Hernia, which had been ſtrangulated for a week, and had reſiſted every effort of the Taxis, there remained no other means but the operation. The Gentlemen attending having requeſted me to perform the operation, I aſſented, and determined to profit by the very judicious obſervations, and accurate deſcription of the parts, as given in your Tranſlation of *Mr. Gimbernat's New Method of operating for the Femoral Hernia.* Johnſon.——My ſubject was a Female near ſixty years of age, the Hernia was on the right ſide, and contained a portion of the ileum. After having opened the ſac, and made every prudent effort to reduce the contents without ſucceſs, I dilated the internal edge of the ring in the manner recommended. This enabled me to replace the contents of the tumor. I then treated the wound by ſuturing and ſuperficial dreſſings. A large opiate given in alcohol immediately after the operation ſteadied the ſtomach, and a few grains of calomel in pills procured a diſcharge by the bowels. From the moment of the operation no untoward ſymptom took place. The wound ſuppurated kindly, and in leſs than three weeks was perfectly healed.

I have before performed this operation, when I divided the upper part of the ring. My patient recovered perfectly, and has remained well ever ſince—now three years. Yet I own I prefer Mr. G.'s mode on two accounts. There is leſs danger of dividing an artery of conſequence (which ſo ſituated is always difficult to take up)—and the parts neceſſary to ſuſtain the viſcera are leſs injured. Theſe are weighty conſiderations.

I am, &c.

E. KENTISH.

Newcaſtle, Nov. 1, 1796.

APPENDIX.

N^o. VIII.

BOWOOD, near CALNE, Oct. 1796.

CASE OF CONSUMPTION.

JOHN HIGHET aged 22 (whoſe father and two Siſters died of a pulmonary conſumption) having over-heated himſelf 18 months ago, got a ſpitting of blood, which was followed by a ſuppuration in the left lobe of the lungs. He coughed very violently, and ſpit a vaſt quantity of pus. He waſted gradually away, ſo that he could ſcarce move about, and was obliged to quit his buſineſs, which was that of a journeyman taylor. He was adviſed by an old man (who had ſince forty years directed the lime-kiln in Bowood park, and who told him that about ten years ago a nobleman was cured by this lime-kiln,) to inſpire every day during an hour the ſmoke of the kiln. He immediately did it and found almoſt inſtantaneous relief by it; the ſpitting changed in a few days from a purulent matter into a clear tranſparent mucus, his cough and pain diminiſhed, the hectic fever abated; and he felt inſtead of heat, rather a chillineſs or cold: his fleſh returned with his appetite and ſtrength, his countenance changed from a ſickly appearance to a healthy look—the pain which he felt near the heart ſhifted to the ribs, where he finds ſince that time a continual uneaſineſs, which increaſes into a painful ſenſation when he lies on his right ſide, which I think comes from the lung being attached to the pleura of the left ſide. In about three weeks he ſeemed nearly cured of the conſumption.

The manner of inſpiring the ſmoke, (I aſſiſted more than once at the operation) was to put his head over the lime-kiln at the place, where, by poking a hole in the ſtones with an iron pointed bar as far as the living coals, a thick yellow ſmoke iſſued ſo as to conceal the whole head from the ſight of the bye-ſtanders. He inhaled this ſmoke with mouth and noſtrils open during a whole hour every morning.

A medical gentleman thought this cure to be performed by the inflammable gaz produced by the coals and by the fixed air mixing with the inflammable: but I doubted much of the foundation of this opinion, as inflammable air muſt very likely be conſumed by the fire of the living coals at the very time of its production.* I think it more probable that the effect was rather owing to the ſmoke carrying with it the balſamic tar infinitely divided in its voleume, which is for the greateſt part tar itſelf. The healing quality of this ſmoke was not owing to any mixture of carbonic acid or fixed air, produced by the calcination of the ſtones into lime; for the ſame patient found alſo a great relief by inhaling the ſmoke of pit coal by a common fire.

It might be reaſonably doubted, whether all pit coal would produce the ſame ſalutary effect, for the nature of pit coal from various mines is very different; ſome containing a great deal of ſulphur, pyrites, alum, and various other ingredients. Thoſe that contain ſulphur would probably prove very hurtful.

I did what I could to procure ſome more patients labouring under pulmonary conſumptions, as alſo ulcerated legs, or ſome diſeaſes of that nature, to try whether this ſmoke would not cure them as readily as it did cure the above-mentioned patient; but I could procure none. It is however well known, a long while ago that lime kilns have had the reputation of curing various diſeaſes, principally pulmonary conſumptions. I believe it worth while trying, to let the patients inhale the ſmoke of pit coal from a common fire. But I ſhould not adviſe to inhale this ſmoke in a concentrated ſtate, iſſuing from theſe coals heated in a retort; as in this caſe a very concentrated inflammable air mixed with the ſmoke may do injury. However, it may be tried with prudence.

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* Heavy inflammable air would, I apprehend, be plentifully diſtilled from the heated, but uninflamed, part of the coals. I am however diſpoſed to agree with Dr. Ingenhousz as to the curative operation of the tar in vapour. *Editor.*

By placing in the middle of the lime kiln flat veſſels filled with lime water, and others filled with a ſolution of turnſol, I found that in half an hour the lime water was ſcarcely precipitated any more than it was at twenty feet diſtant—that turnſol was not changed at all in colour. But in half an hour I found the oleum tartari per deliquium, rubbed againſt the inſide of a cylindrical glaſs, cryſtallized into aciculary cryſtals, as it cryſtallizes in a brew-houſe or where beer ferments. An equal quantity of theſe coals and lime-ſtone diſtilled in a ſtone retort, gave a vaſt deal of fixed air mixed with very concentrated inflammable air and ſmoke. The inflammable air burned with a brilliant flame in a cylindrical glaſs, in which it was received from the retort. The ſides of this glaſs were all lined with a coat of ſemi-tranſparent tar.

J. INGENHOUSZ.

NOTE.

The Editor has been well informed of another French lady (now in England) believed to be phthiſical, and cured by Dr. Saiffert's method of cows. This lady lived ſix entire weeks with the animals. He has heard a third caſe mentioned. It was perhaps the celebrity of theſe facts that led Mad. Genlis to mention the method in her *Veilleês du Chateau*. It ſeems therefore that the practice was followed up, and with a degree of ſucceſs. It is ſingular that the medical chemiſts of Paris ſhould not have noticed it.

ERRATA.

P. 152, l. 9, for *was* read *were*—l. 22, for *canel* read *coerul.* P. 35, l. 9, dele "*to ſupport*," and correct ſome other ineſſential errors.

N. B. The plates are numbered in continuation from Mr. Watt's plates in Part II, and there are only two (viz. Pl. IV and V) belonging to Parts IV and V of theſe Conſiderations.

END.